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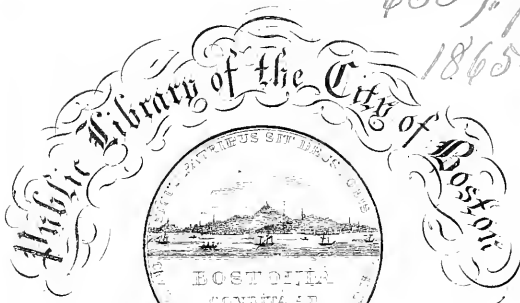
ANNUAL REPORT
OF THE
COCHITUATE WATER BOARD
FOR
1865-6.

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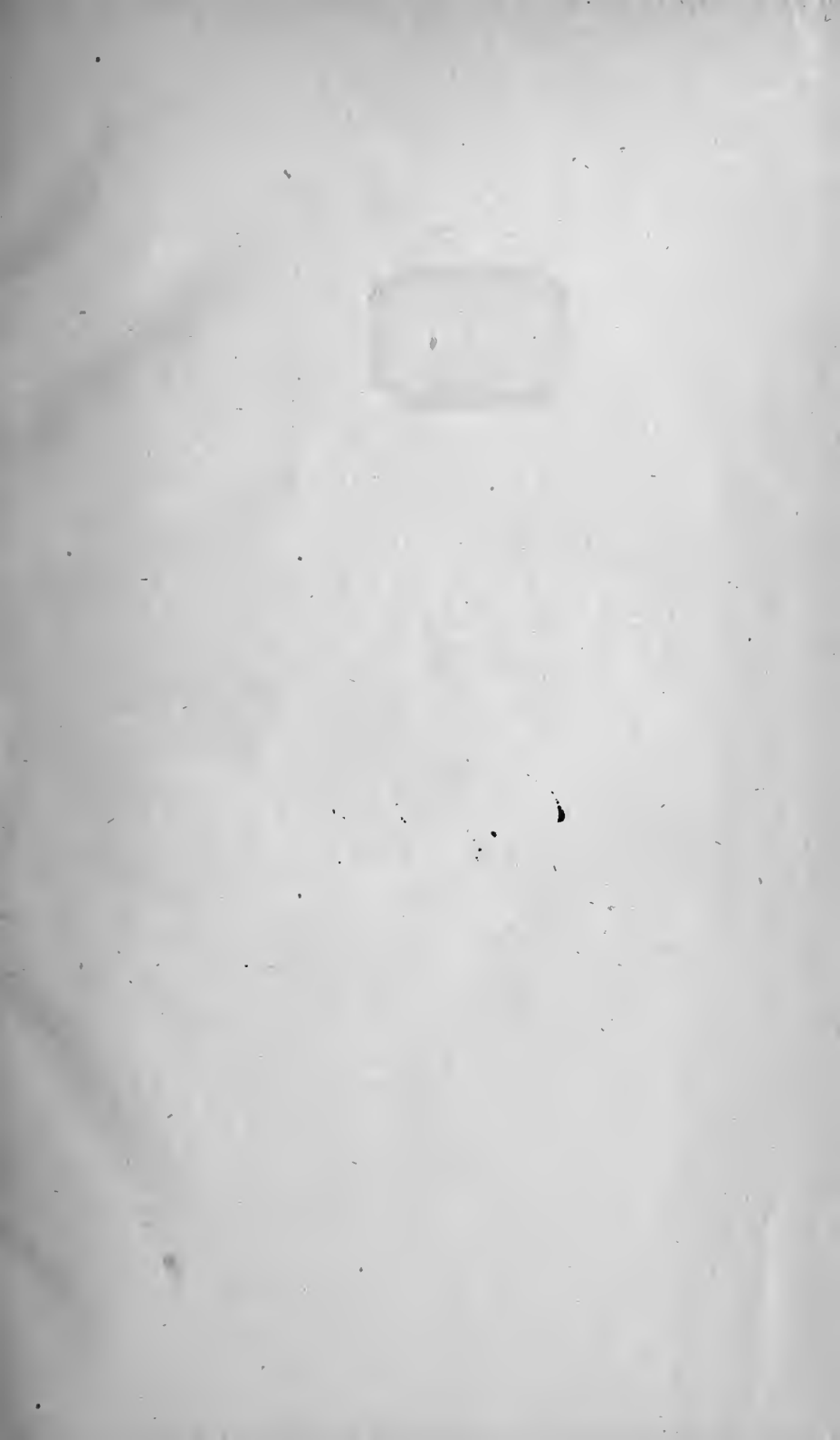
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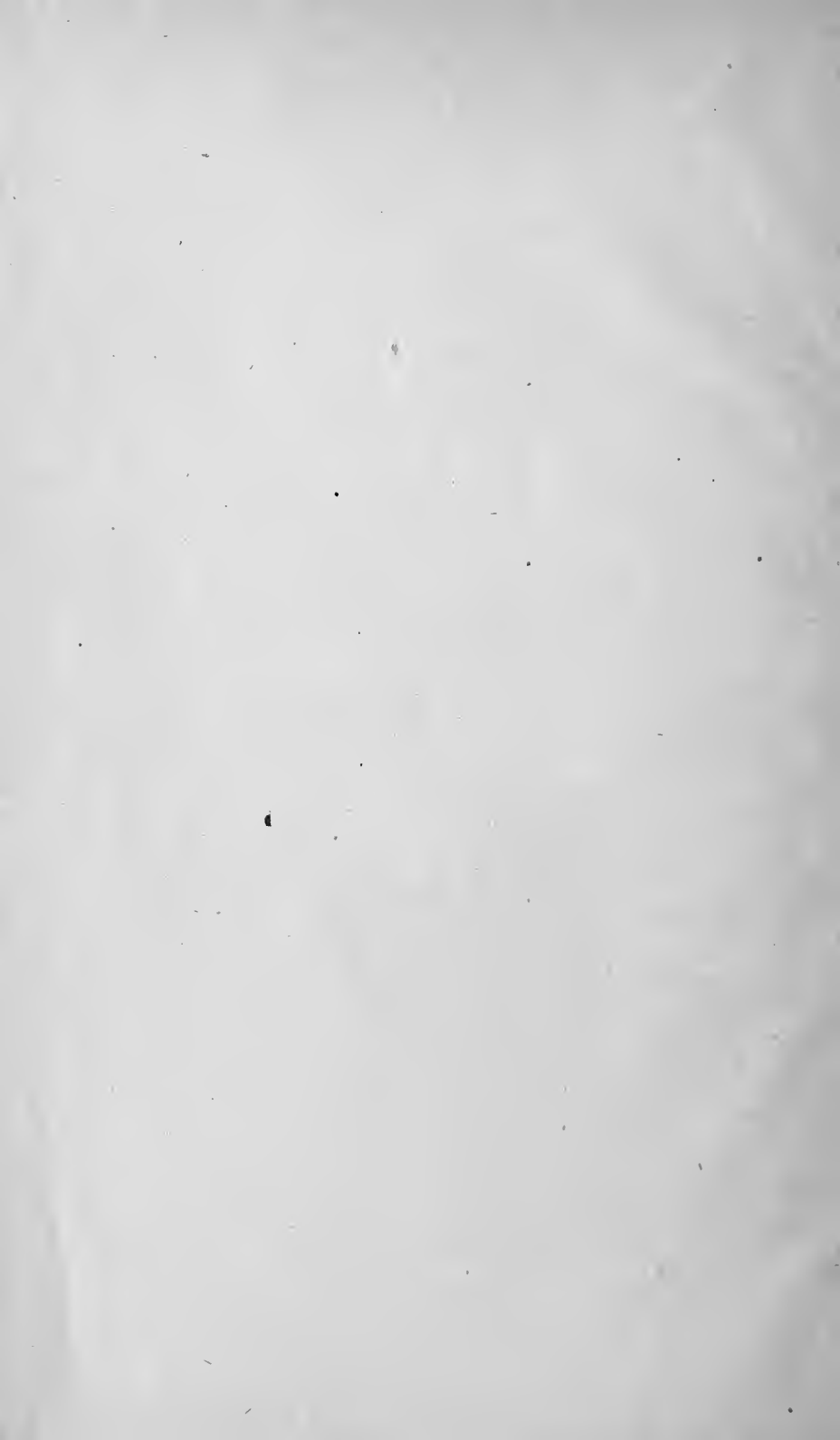
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By City of Boston.
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City Document.—No. 61.

CITY OF BOSTON.



REPORT
OF THE
COCHITUATE WATER BOARD
TO THE
CITY COUNCIL OF BOSTON,
FOR THE YEAR 1865-66.

1881

667. 98, 1868.

CITY OF BOSTON.

In Common Council, May 24, 1866.

ORDERED: That the Cochituate Water Board be authorized to report in print.

Sent up for concurrence.

BENJ. DEAN, *President pro tem.*

In Board of Aldermen, May 25, 1866.

Concurred.

GEO. W. MESSINGER, *Chairman.*

Approved May 26, 1866.

F. W. LINCOLN, JR., *Mayor.*

A true copy.

Attest: S. F. McCLEARY, *City Clerk.*

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REPORT.

OFFICE OF THE COCHITUATE WATER BOARD,
Boston, May 20, 1866.

TO THE CITY COUNCIL.

The previous reports of this Board have been made annually ending on the 31st of December. The financial year of the City Government ends on the 30th of April, and the accounts of the Auditor and Treasurer are made to that date, including in their yearly statement of the cost of the Water Works, the current expenses for the four months between December 31 and April 30, and also the large item of yearly interest upon the unfunded water debt. These items have not appeared in the cost of the Works as made up by us. In order to remedy this apparent discrepancy in stating the total cost of the Works by the different departments, this Board petitioned for leave to make their Report in future to April 30. Leave was granted, and the ordinance was changed in conformity by the City Council, December 27, 1865. Consequently this Report will contain the business and expenses for the sixteen months from January 1, 1865, to April 30, 1866, inclusive.

The supply of water for the past year has been sufficient to meet the requirements for domestic and mechanical purposes, and a limited quantity has been used for ornamental fountains.

On the 31st of March, 1865, the water at the lake commenced to run over the dam into Sudbury River, and continued to do so until the middle of June, wasting, according to

an estimate of the City Engineer, 1,688,120,674 gallons. During a portion of the year 1865 the water was higher in the lake than upon the corresponding dates of the preceding year, varying from three inches in July to three feet eight inches in December, afterwards losing the excess gradually until March 7, 1866, at which date it was at the same point as upon the same day of the previous year, say ten feet six inches above the bottom of conduit. On the first day of the present month the water was twelve feet two inches above the bottom of conduit, against high water, or thirteen feet and four inches, upon the first day of May, 1865. The absence of snow upon the ground to be dissolved by the early spring rains was one of the causes of the deficiency of water.

The rain-fall at Lake Cochituate during May, 1865, was about eight inches; so far the present year, the amount has been trifling. Unless we are favored with copious rains during the summer and fall, it will require the strictest economy to keep up the supply of water throughout the year, without the doubtful and expensive expedient of raising it by artificial means to the level of the conduit. By the tables of the Engineer it appears that the rain-fall for 1865, was the average of the last ten years. Yet there was during the last year, and is now, a very general complaint in the neighboring towns of the scarcity of water, and much inconvenience, if not sickness, has been consequent upon it.

The constant supply with which our inhabitants have been blessed should always be kept in mind, and the efforts of the Water Board *continue* to be seconded by all good citizens, not only by preventing waste upon their own premises, but by giving prompt notice of waste by others. The apprehension of a short supply will necessitate the greatest watchfulness on our part; and if it is found necessary to subject the takers to some slight inconvenience from the visits of the inspectors, it must be borne with patience, as it is only in this way we can detect the improvident and wasteful.

The number of notices issued for leaks from January, 1,

1865, to May 1, 1866, 9,555

Number of persons fined for waste 3,093

One cause of excessive use, if not actual waste, of water is attributable to the use of self-acting and Hopper closets, *with improper fixtures*.

In the report of Water Registrar, City Document 11, of 1862, he states the number of these closets in use at that time was 5,654, since which the number has increased to 8,000. By experiments made by the Registrar, the consumption of water by these closets was found to be many times in excess of the ordinary pan closets. It is doubtful if the City Council can prohibit the use of hopper closets. Yet it would be but just that a price should be charged for their use, in accordance with the quantity of water consumed, and this would perhaps prevent their increase, if not abandonment.

The Water Board contemplate the appointment of two or more officers whose duty it will be, upon an alarm of fire, to assist in opening the hydrants, and to see that they are properly closed after the hosemen have left; to visit the hydrants used for supplying the steamboats with water for cleansing decks and other purposes; and to have a general supervision of all hydrants so far as to prevent improper use. It will be desirable that these officers have police powers. In other cities a large number of such officers are advantageously employed.

The present arrangements for a supply of water, particularly in case of fire, are somewhat more extensive than during the early days of the town. Mr. Quincy says "In 1653 leave was granted to the inhabitants to sink a twelve-foot cistern at the pump which stands in the highway, to be helpful against fire." And in 1670, "There having been found a great want of water in case of fire, every inhabitant was ordered to have a hogshead well filled with water, with the head open, near his door, under a penalty of five shillings."

In order to ascertain as nearly as possible the consumption for domestic purposes “per capita,” about a year since a meter was placed in the house of each member of the Water Board, and an account of the water used was taken as often as once each month. The consumption in the different houses varied very considerably, notwithstanding the number of persons in each family was taken into account. Whether this was in consequence of more freedom in the use, or from the fact that at some houses the water was drawn under direct pressure, whilst at others it was drawn from a cistern upon the premises, has not yet been determined. It is, however, fair to presume that about the same variation exists throughout the city. The result of this experiment gives an average daily consumption of $24\frac{1}{10}$ gallons of water by each individual.

WATER REGISTRAR.

The Water Registrar reports the income for the year in his department as follows:—

Total receipts for water rents to Jan. 1, 1866,	\$ 451,433 48
Dues of previous years,	\$ 23,054 16
Letting off and on	1,092 00
	<hr/>
	\$ 24,146 16
Making net receipts for water used	<hr/>
in twelve months	\$ 427,287 32

The receipts for the four months, from January 1, 1866, to April 30, 1866, was \$ 340,966.53. Of this amount \$ 313,-801.47 was in payment for water *to be delivered during the year*, the water rates being payable in advance on the 1st of January of each year.

The number of meters has been largely increased. If it were not for their high cost (*about \$ 50 each*) it would be desirable to deliver all the water by measure, and then each taker would pay for what he consumed. If such a system could be adopted the quantity of water drawn from the Lake would be

reduced nearly, if not quite, one third. However desirable this may be, it cannot be accomplished at present, for we have failed as yet to find a cheap, reliable meter. The whole number of takers is 27,489, and much the largest proportion pay less than \$ 10 a year. Consequently the expense at present cost would nearly consume the income.

For a detail of the business of the *Registrar's* department, and for many very interesting statistics, we refer you to his Report, which is annexed.

On the 26th of June last, the Board of Aldermen requested the Water Board to communicate to them "*the reason which prevented the playing of the public fountains.*" In answer to the request this Board made a Report (City Document 57, for 1865) furnishing a statement of the consumption of water by the different fountains then in use, and such other information as we deemed pertinent. The quantity of water necessary to play some of the fountains was so large that the Board thought it best to withdraw them from use and substitute others of the same general character, but more economical in the consumption of water.

The scale of rates for water sold by meter which had been substantially in use from its introduction into the city, was found by experience to be very objectionable, and a change to a uniform rate was recommended. A difference of opinion existing in the City Council as to the price to be charged for 100 gallons, the question was referred to this Board, and after careful consideration an answer was returned that three cents per 100 gallons was the lowest price that could be charged, if the receipts were expected to meet the expenses and interest upon the water debt, as required by the act of the Legislature giving authority to introduce water. Whilst the matter was under discussion a communication was sent to the City Council, containing a statement of the water debt, the deficiency of income of former years, and the probable receipts for the future (City Document 76, for 1865).

On the 22d of November, 1865, the City Council fixed the price for water delivered through a meter at the *uniform rate of three cents per 100 gallons*.

During the present year the records at the Registry of Deeds for Middlesex, Norfolk, and Suffolk counties have been carefully examined, and every deed or other paper relating to real estate, whether purchased or sold by the Water Commissioners or Water Board, has been copied and substantially bound in two volumes, to be hereafter preserved in the office of the Water Board.

On the 18th of October last, His Hon. Mayor Lincoln, with the members of the Water Board, the City Engineer, and Superintendents of the Western and Eastern Division, by the invitation of the Water Board of the city of Charlestown, visited the water works belonging to that city. We witnessed a very satisfactory trial of the "Lowry" hydrant, playing five streams of water at the same time, to the height of fifty or sixty feet. We then visited the new Reservoir on Walnut Hill, gate-house, engine-house, &c. and the dam and works at Mystic Pond, all of which we found in good order, and, as far as we could judge, thoroughly built. We were particularly pleased with the working of the "Worthington Horizontal Pumping Engine," which appeared to do its work quietly but effectually. Our visit was very instructive and satisfactory.

. CITY ENGINEER.

Annexed will be found the Report of the City Engineer, containing, in addition to a variety of information in regard to the works as connected with his department, several statistical tables of great interest as well as of practical value. From the Report we learn that the consumption of water for 1865 was reduced twenty-five per cent, as compared with the consumption of 1864. One consequence of this economy was, that the citizens who resided upon the high grades were accommodated with a more regular and abundant supply of water than for

some years past. The tables giving the yearly, monthly, and hourly consumption of water have been prepared with great care, and will repay a careful examination.

WESTERN DIVISION.

Chestnut Hill Reservoir.—The demand for water by manufacturing and mechanical establishments, consequent upon the growth of our city, in addition to the increased quantity required for domestic purposes, has, for some years, been a cause of anxiety to the Water Board. The additional quantity gained by the connection of Dudley Pond with the Lake in 1862, did not fully satisfy the Board of that year, and in their Report they recommended the City Government “to build a new reservoir somewhere near this end of the aqueduct for the storage of all the surplus water the Lake can furnish.” And each subsequent Board, in their Reports, have urged the importance of a large reservoir for the purpose of holding an additional supply of water, and also as a safeguard in case of accident to the conduit.

On the 8th of December, 1864, an order passed the City Council authorizing the Water Board to purchase lands for the construction of a new reservoir, and \$50,000 was appropriated for that purpose. After careful investigation, the basin near Chestnut Hill, on either side of Beacon Street, and lying in the towns of Newton and Brighton, was selected. An Act of the Legislature was obtained April 4, 1865, granting to the city of Boston the right to construct and maintain a reservoir in the above location, and conduct the water into the City. The Water Board at once proceeded to purchase the land required. Terms satisfactory to both parties have been made with the owners, with the single exception of the proprietors of a parcel containing about three acres, and we regret that the terms demanded render it our duty to take it under the act. A portion of the land purchased can be sold, if thought advisable, when the works are completed. It was deemed prudent to buy out-

right those and liable to injury, rather than subject the city to damages, which former experience had taught us were often estimated by juries at nearly, if not quite, the original value of the estate. By subsequent action of the City Council, the Water Board were authorized to prepare the necessary surveys, and to construct a reservoir to hold not less than 500,000,000 gallons of water (*for estimates, see City Document 85, for 1865*). The surveys were at once commenced, under the direction of N. Henry Crafts, Esq., City Engineer. Mr. Edward F. Knowlton, who had been engaged in the construction and management of the Water Works from their commencement, and who had been Superintendent of the Western Division for many years, was appointed Superintendent. Mr. Knowlton commenced his duties in December, 1865, by the construction of a culvert in Beacon Street, for the purpose of draining the meadows, to facilitate the work in the spring. Early in January, 1866, his health began to fail, and he was not afterwards enabled to give much attention to matters connected with the Reservoir.

Mr. Knowlton died on the 12th of March, 1866, and was buried on the 15th, at Natick, Mass. Many members of the City Government, a large number of his personal friends from Boston, and the members of the present and past Water Boards, attended his funeral. He was a faithful and efficient officer, taking especial interest in all matters connected with his department. His liberality and social qualities gained for him many friends; his intimate knowledge of all matters connected with the Western Division, and his prompt attention to business, rendered the duties of the committee upon that division comparatively easy.

On the 26th of March, Mr. Albert Stanwood, formerly Superintendent of the Eastern Division, was appointed Superintendent of "Chestnut Hill Reservoir," and entered upon his duties April 2, 1866. It being impossible to purchase, or lease, buildings in the vicinity adapted to our wants, stables,

an office, boarding and lodging-houses for the men, a blacksmith shop, tool houses, and other buildings are being erected. At the present time, about one hundred men are employed in removing the soil, preparatory to commencing the bank, and in clearing the land of stumps and rocks. When the buildings are ready for occupancy, the number of laborers will be increased.

The gate-house and other structures at the Lake are generally in good order. The usual annual repairs will be required, and very soon much of the fencing must be renewed. At a proper time, it will be advisable to erect another house, for the use of the Superintendent. The house heretofore occupied by that officer is becoming old, and is not in the most desirable location for his residence. It could, however, be occupied advantageously by some of the employees upon the works, who are now compelled to reside at a considerable distance.

The bridges, culverts, waste weirs, pipe chambers, and embankments, from the Lake to Brookline, were thoroughly cleansed, and put in good order, during the spring and summer.

The water has been drawn from the conduit for various purposes twelve times during the year. A committee of the Board, the City Engineer, and the Superintendent, took these opportunities for making personal inspection of the interior. At different times, very nearly the whole line from the Lake to Brookline has been examined. Such repairs, as the limited time during which the water could be kept out of the conduit would allow, have been made. Several of the man holes were found in need of repair, to prevent the sand being washed into the conduit, and they have since been thoroughly cemented. The sections of the aqueduct most in need of attention are those nearest to Chestnut Hill Reservoir, and at Webber's Barn. They will be again examined at the earliest opportunity. As soon as the new Reservoir is completed, the whole line should be put in thorough repair.

A slope wall has been laid during the year at the high bank next northerly from the gate-house, which will prevent the farther wash of the sand at that bluff. It is essential that this wall should be continued for a considerable distance in the same direction, as the sand from this shore is fast forming a bank in front of the gate-house, and will soon prove a serious inconvenience.

The island on the westerly shore of the Lake, near the Superintendent's house, which was washing away, has been surrounded by a stone wall, and sodded, and is now a pleasant feature in the scenery of the Lake. As the work at this island was done at the suggestion and under the direction of our late worthy Superintendent, it is proposed that, in remembrance of him, it shall henceforth be known as *Knowlton's Island*.

The right of flowage at Lake Cochituate is predicated upon the location of Knight's Flume, so called, both in the original deeds and in the subsequent acts of the Legislature. This flume is a portion of the old mill which belonged to Mr. Knights, from whom the City purchased the property, and is situated within the Lake, and about thirty feet above the outlet-dam, in a southeasterly direction. The floor of the flume is always covered by water, and is liable to be carried away or displaced by accident. In order to fix this important point permanently, the City Engineer, at the request of the Board, on the 22d of October, the water being then at a favorable stage, directed it to be dammed out so as to expose to view the original plank composing the floor of the flume, and the point to which we are allowed to raise the dam above said flume, by the act of the Legislature, April 5, 1859, was permanently preserved by causing the centre stone abutment of the outlet-dam to be cut down to the exact high-waterline, and the following inscription cut in the stone: "H. W., Apl. 5, 1859."

As a further precaution, the levels were taken from Knight's Flume to the gate-house and to other points, which agree

substantially with the measurements as recorded in former Reports. The results were as follows:—

Floor of Knight's Flume,	124 $\frac{36}{100}$	feet above tide marsh level.
High Water,	134 $\frac{36}{100}$	“ “ “
Gate-house floor,	138 $\frac{10}{100}$	“ “ “
Interior bottom of Conduit,	121	“ “ “
Do. do.	3 $\frac{36}{100}$	“ below floor of Knight's Flume,
Gate-house floor, Conduit.	13 $\frac{74}{100}$	“ above the bottom, of

The limit of flowage at Dug and Dudley's ponds was preserved by inscriptions cut in the stone curb of the outlet-gate-chamber at each pond. A particular description can be found in Report of City Engineer, dated Jan'y 17, 1866, upon the records of the Water Board.

The purchase from Eben Whitney of about three and a half acres of land in the town of Natick, lying on both sides of Pegan Brook, was completed by the present Board. This purchase of land was made to obtain the control of the mouth of that brook, which serves as a sewer to a considerable portion of the village of Natick. A filter-dam was constructed last year across its mouth, and has done good service. It is the intention of this Board, at the earliest practicable moment, to construct another filter upon the dam originally built to separate Whitney's meadow from the Lake.

During the summer a new Culvert was laid under the roadway in Natick for Course Brook. By the action of the water and ice last winter it received some damage. It has been repaired as well as circumstances will allow; and as soon as the stage of water will permit, it will be put in thorough repair.

The boundaries of the land owned by the City in the vicinity of the Lake need careful examination. The setting of boundary posts, commenced last year, should be completed

and trespassers removed before they gain possession, or the rights of the City otherways secured.

Owing to the low state of the water on the 26th of Dec., 1864, the water from Dudley Pond was let into the Lake. This pond having a very limited area of water-shed, it rises slowly, but is now nearly at high-water-mark.

Dug Pond was at high-water-mark on the 18th of July last; subsequently the water has been let into the Lake, and it now stands at one foot two inches below that point.

The walks and grounds at *Brookline Reservoir* are generally in good order. The gate-houses need attention; but these structures, like the conduit, cannot be spared long enough for extensive repairs at present. As soon as the works are in condition to allow it, they must have a most thorough examination. A small tool-house is required, as the room in the gate-house, intended and heretofore used for the purpose, is unsuitable from dampness. A portion of the wooden fence needs immediate attention.

The town of Brookline have claimed the right to tax the Reservoir and other real estate connected with the Water Works, situated in that town, and have levied taxes thereon. Believing that the property was not legally subject to taxation under the principle which we were advised universally prevails, that Corporations chartered for public purposes and for the public good, and not for private gain, hold their corporate property free from assessment for taxes; measures were taken to bring the claim of that town to a legal decision. An appeal was taken from the Assessors of Brookline to the County Commissioners of Norfolk County, and heard on the 27th day of December last, when a decision was made in favor of the City in accordance with the views we had previously entertained. The same question has been raised before by the town of Wayland, and was decided finally by the Supreme Judicial Court. The decision may be found in the 4th vol. of Gray's reports, page 500.

A schedule of the property in use upon the Western Division will be found annexed.

EASTERN DIVISION.

The work of the most importance during the year in this division was the raising of the 30 and 36 inch mains on Tremont Street. 1650 feet of each were successfully raised and secured in a manner creditable to the Superintendent. The total cost, including paving, was \$16,322.91.

The land appropriated by City Council, Dec. 16, 1864, to the use of the Water Board, on the easterly side of Albany, and near Concord Street, has been inclosed by a substantial fence, and a building erected for the storage of materials and pipes. At some future day it is the intention of the Board to erect a house to be occupied by one or more of the employees of the department, who will serve as watchmen over the property in the yard, and attend to leaks or accidents that may occur to the pipes in that section of the City. For the detail of the work in this division, you are respectfully referred to the report of the Superintendent, which is annexed.

The following statement is from the Report of the Clerk of the Board. For further particulars reference must be had to his report, which is annexed : —

Amount of current expenses from January 1, 1865, to April, 30, 1866, including the raising of the pipes upon Tremont St., cost of meters and sundry other items which have heretofore been charged to "extension of works,"	\$ 158,867 05
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Extension of works, including main pipe, land purchased of Whitney (at lake), and buildings and fence at new pipe yard on Albany St.	\$ 20,213.70.
Chestnut Hill Reservoir, including cost of the land,	

107,282 02

\$ 266,149 07

<i>Amount brought forward,</i>	\$ 266,149 07
<i>Credit, — By receipts for fines, letting off and on water, laying pipes, rent, &c.</i>	20,400 00
	<hr/>
Balance,	\$ 245,749 07
Salary of Water Registrar from January 1, 1865, to May 1, 1866,	\$ 2,533 34
Salary of treasury clerk in Water Board office,	2,000 00
	<hr/>
	\$ 4,533 34
The amount of interest and premium on gold charged by Treasurer to the Water Works for financial year ending April 30, 1866, is,	\$ 453,925 00
Total expenditures for the Water Works to April 30, 1866,	\$ 12,152,934 94
Total receipts from all sources to same date,	5,380,959 79
	<hr/>
Net cost of Water Works, including \$ 107,- 282.02 expended on account of Chestnut Hill Reservoir, to April 30, 1866,	\$ 6,771,975 15

STATISTICS.

The following statistics, although most of them are to be found in the former Reports of the Board, may be of interest to the public : —

1846. March 16. Act of Legislature granting leave to introduce water.

1846. August 20. Work commenced.

1848. October 25. Water celebration.

1859. April 5. Act of Legislature granting leave to raise the dam an additional two feet, making ten feet above Knight's flume.

Lake Cochituate, at high water, flows about 800 acres. Capacity of one foot at high water is estimated at 260,000,000 gallons. Water shed, 496,584,000 square feet.

Dudley Pond, at high water, flows about 81 acres. This pond is shallow and has a limited water shed.

Dug Pond, at high water, flows about 44 acres, and is a deep and reliable reservoir. High water is seven feet above high water in the Lake.

Conduit — Length from Lake to Brookline reservoir 14 miles and 446 feet, including pipes at Charles River, and tunnels; commenced October 19, 1846; water let into it Oct. 12, 1848; built of brick, 8-inch thick, egg shape, 6 feet 4 inches high, 5 feet wide; descent, $3\frac{1}{8}$ inches to mile; total descent, $4\frac{2}{10}$ feet; conduit cost, \$ 817,717.73; land cost, \$ 218,992.35.

Brookline Reservoir — $22\frac{9}{10}$ acres; depth 14 to 24 feet; water let into it Nov. 16, 1848; capacity at two feet below dam about 120,000,000 gallons; reservoir cost, \$ 166,720.85; gate-house cost, \$ 33,356.36.

Beacon Hill Reservoir — Capacity, 2,678,961 gallons; 16 feet deep; total cost, \$ 513,353.21; size, 290 feet by 190 outside, 167 feet by 162 inside; height of wall, lowest point, 40 feet 8 inches; walls 3 to 5 feet thick; water let in to it November 23, 1849.

South Boston Reservoir — Capacity, 7,508,246 gallons; 21 feet 3 in. deep; water let into it Nov. 28, 1849; cost, \$ 90,908.10.

East Boston Reservoir — Capacity, 5,591,816 gallons; 30 feet deep; total cost, \$ 66,103.09; water let into it Jan. 1, 1851; size, 322 by 150 feet.

Chestnut Hill Reservoir is estimated to have, when finished, a water surface of 125 acres, and to hold about 700,000,000 gallons of water.

1859. March, 29. The break at Charles River crossing; 100 feet conduit, gate-house, and pipes carried away; water let in again on the 2d and 3d of April; cost, \$ 15,380.73.

Large Iron Mains. — The water is brought from Brookline Reservoir in three mains. A 30 and 36-inch through Roxbury and Tremont Street, laid 1847. A 40-inch was laid over Mill-dam, 1859. The act of the Legislature confirming the right of the City to maintain it there was approved May 13, 1864.

Respectfully submitted,

OTIS NORCROSS,
L. MILES STANDISH,
NATHL. J. BRADLEE,
JONAS FITCH,
ALEXANDER WADSWORTH,
JOHN H. THORNDIKE,
BENJ. F. STEVENS,

Cochituate Water Board.

Schedule of property in use Western Division.

1 cart and harness, 2 boats, 30 shovels, 10 picks, 1 level, 1 wagon and harness, 1 hand-cart, 4 crowbars and rammers, 4 water-pails, 2 grindstones, 4 pair rubber boots, 22 lanterns, 2 hammers, 2 grass-hooks, 4 wrenches, 4 trowels, 2 axes, 2 hoes, 1 pair hedge-shears, 1 gravel-scow, 1 screen, 1 rain-gauge, 1 stove, 1 desk.

OFFICE OF THE COCHITUATE WATER BOARD,
BOSTON, JUNE 1, 1866.

OTIS NORCROSS, ESQ. *President of the Cochituate Water Board*:—

SIR,—

The following is a statement of the

RECEIPTS AND EXPENDITURES.

*Statement of Expenditures made by the Cochituate Water Board,
from December 31, 1864, to May 1, 1866.*

Plumbing shop, for stock, &c.	\$ 191 44
Blacksmith shop “ “	603 94
Raising pipes on Tremont Street	16,322 91
Land and water rights	1,200 00
Stables	1,513 45
Taxes	214 87
Fountains	410 82
Postage and express	35 22
Tolls and ferriage	174 16
Tools	214 76
Oil	128 75
Travelling expenses	152 64
Reservoirs, — Beacon Hill	878 55
“ South Boston	565 99
“ East “	529 52
“ Brookline	1,103 00
<hr/>	
<i>Amount carried forward,</i>	<i>\$ 24,240 02</i>

<i>Amount brought forward,</i>	\$ 24,240 02
Repairing fenders at Chelsea and Charlestown bridges	4,070 89
Lake	3,680 32
Aqueduct repairs	2,176 72
Extra inspectors	9,505 95
Service pipe	9,297 38
Main pipe	11,264 79
Salaries (including clerks and inspectors in the water registrar's office,)	13,248 89
Meters	29,709 00
Maintaining meters	1,553 59
Damage	10 00
Printing (including Water Registrar's and Superintendent's,)	981 10
Stationery (including Water Registrar's and Superintendent's,)	694 31
Watchmen's services	151 82
Miscellaneous expenses,— Copying two volumes of deeds, expense of the Board, repairing safe lock, &c. &c.	988 59
Office expenses	72 00
Laying main pipes, for stock, &c.	597 11
Repairing stop-cocks	821 05
“ main pipe	2,874 46
“ hydrants	3,371 02
“ streets	3,814 36
“ service pipes	5,982 32
Wages, — Laying main pipe	2,112 03
“ “ service pipe	3,468 41
“ Proving yard	4,139 64
“ Blacksmith shop	1,440 90
“ Plumbing shop	662 43
<i>Amount carried forward,</i>	\$ 140,929 30

<i>Amount brought forward,</i>	\$ 140,929 30
Off and on water, non-payment, waste and repairs	6,145 17
Hydrants	1,471 85
Proving yard, stock, &c.	1,772 34
Stop-cocks	1,608 97
Hydrant and stop-cock boxes	1,899 65
Upper yard, fence, buildings, &c.	5,039 77
Chestnut Hill Reservoir	107,282 02
	<hr/>
Whole amount drawn by the Board	\$ 266,149 07
	<hr/>
Amount charged Chestnut Hill Reservoir	\$ 107,282 02
Amount drawn for Water Works	158,867 05
	<hr/>
Total from January 1, 1865, to May 1, 1866,	\$ 266,149 07

CASH PAID CITY TREASURER.

For rent of Arches under Beacon Hill	
Reservoir	\$ 375 00
For land sold	358 83
“ Wood “ at Lake	550 78
“ Meter “	50 00
“ Fines for waste, &c., &c.	6,886 00
“ off and on water for repairs,*	2,409 75
For Pasture	40 00
“ Pipe, laying, repairing, &c., &c.	9,363 64
Chestnut Hill Reservoir, wood sold	366 00
	<hr/>
	20,400 00
	<hr/>
Balance	245,749 07
	<hr/>
Chestnut Hill Reservoir credited, wood sold	366 00
Water Works credited, sundries	20,034 00
	<hr/>
	20,400 00

* The City Treasurer received for off and on water for non-payment of rates \$1,778.

Amount brought forward,

Total amount drawn for \$ 266,149 07

EXTENSION OF THE WORKS.

Land of Mr. Whitney . . .	\$ 1,200 00	
Main pipe	11,264 79	
Wages laying main pipe . . .	2,112 03	
Laying main pipe	597 11	
Upper yard	5,039 77	
	<hr/>	20,213 70

245,935 37

Less amount charged Chestnut Hill Reservoir

107,282 02

Amount of expenses since Jan'y 1st, 1865

138,653 35

*Expenditures and Receipts on Account of the Water Works, to
May 1, 1866.*

Amount drawn by Commissioners . . .	\$ 4,043,718 21
“ “ Water Board, 1850, . . .	366,163 89
“ “ Cochituate Water Board to	
July 1st, 1865	1,598,082 16
Am't drawn from Jan. 1st, 1865, to	
May 1st, 1866	266,149 07
	<hr/>
	\$ 6,274,113 33

Amount paid the City Treasurer

by the Commissioners . . \$ 47,648 38

Am't paid by Water Board, 1850, 8,153 52

“ “ Cochituate Water Board

to Jan'y 1st, 1865 . . . 128,712 08

Am't paid from Jan'y 1, 1865, to

May 1, 1866 20,400 00

204,913 98

Net amount drawn from the Treasurer by the
Commissioners and Water Boards,

6,069,199 35

Gross payments for account of the Water	
Works,	12,152,934 94
Gross Receipts,	5,380,959 79
<hr/>	
Net cost to the city, May 1, 1866 . . .	\$ 6,771,975 15

SAMUEL N. DYER,

Clerk Cochituate Water Board.

REPORT OF THE SUPERINTENDENT OF THE EASTERN DIVISION.

Boston, *May* 11, 1866.

OTIS NORCROSS, Esq. *President Cochituate Water Board.*

SIR: I herewith submit my Report for the year 1865, as also a Report for from January 1, to April 30, 1866.

A comparatively small amount of main pipe has been laid during the last year, owing to so few buildings having been erected on new lands. The largest part of the labor performed by the pipe-laying department was, in raising and lowering mains to conform to the change in the grade of the streets, an account of which I give below.

The excessive cold weather during the months of January and February, of the year 1865, caused more freezing in the mains and services than in any year previous, in consequence of which I have altered the rule of grade for laying these pipes, burying them from four and one half feet to five feet deep, as the location or soil may suggest.

The 20-inch main over South Boston bridge was discovered to be broken, February 8, 1865, caused by the settling of one part, the other resting on a pile,—it was repaired the same day. This was the only instance, during the year, of any leak of note.

This line was opened this spring to ascertain the effect of the bitumenous coating after the action of the water on it for eight years. It was opened in the presence of a portion of the Water Board and the City Engineer. I refer you to his Report for the details.

The 40-inch gate at the Brookline Reservoir being out of order so much as to make it impossible to close it, on the 8th of April, 1865, the line was shut off, and the defect discovered to be occasioned by a large quantity of stone chips, some chisels, and other things in the recess where the friction wheels traverse. The power applied to shut this valve was so great as to completely cut off the two one-and-one-half-inch brass axles of the wheels. They were cut as squarely as if they had been between the jaws of powerful shears. The defect was repaired on the 14th instant.

The 40-inch gate at the Milldam Four Corners is in a bad condition now. When this is repaired, I would suggest that the gate-chamber be boxed with clay. Now, at every flow of the tide, it is filled with water, and will make the work of too long duration unless some method is taken to keep out the tide.

A portion of the fender, or guard, to the pipes under Warren Bridge was carried away last season and has been repaired, and now appears to be strong enough to resist any pressure likely to be brought against it.

The planking over the high water gates on the Milldam has been removed during the year. The old covering was completely rotten, as also the covering of the pipes over the culvert on the Brookline road, near Appleton Place.

The extreme cold of the eighth and ninth of January, of the present year, caused the freezing of quite a number of the meters then in use. A great many of the buildings in the city are so constructed as to make it impossible to attach the meters so that they will escape the frosts, however much care may be observed in locating them, and it is extremely difficult to decide in the warm season the most suitable place to prevent this difficulty. I would suggest that the Board, as far as is possible, furnish me, in the cold season, a list of buildings that they propose to meter, so that the warmest place may be selected.

The mains that have been changed during the year are as follows : —

Raised, 1,650 feet of 36 inches,	}	between Waltham and
“ 1,650 “ 30 “	}	Newton streets.
“ 500 “ 12 “		on Way Street.
“ 663 “ “ “		on Newton Street.
“ 380 “ 6 “		on Border Street, and lo-

cated on the opposite side of street.

Taken up, 264 feet of 4 inches, on Western Avenue.

“ 624 “ 4 “	on Brookline Street.
Lowered, 168 “ 4 “	on Concord Square.
“ 293 “ 4 “	on Temple Place.

Statement of Location, Size, and Number of Feet of Pipe laid in 1865.

In what Street.	Between what streets.	Diameter of pipe in inches.	Feet of pipe.
BOSTON PROPER.			
Rutland Square...	West of Tremont.....	6	323
Montgomery.....	Union Park and Clarendon.....	6	215
Dedham	West of Tremont.....	6	122
St. James.....	Berkeley and Clarendon.....	6	424
Albany	Concord and Springfield.....	6	197
Canton.....	West of Tremont.....	6	39
Canton.....	Albany Street and Harrison Avenue..	6	100
Pembroke.....	West of Tremont.....	6	200
Kendall.....	Tremont and Washington.....	6	464
Tremont.....	Lenox and Kendall	6	29
Ferdinand	South Cedar and the R. R. Bridge....	6	279
Total 6 inches in Boston.....			2,392
Concord Square...	West of Tremont Street.....	4	246
Total 4 inches in Boston.....			246
SOUTH BOSTON.			
Eighth.....	Mercer and Gates.....	6	207
Highland	Newman and Jenkins.....	6	310
N	Fourth and Seventh	6	806
Total 6 inches in South Boston....			1,323
Bolton.....	B and C.....	4	196
Dove.....	Dorchester and F.....	4	185
Foundry.....	For S. B. Iron Co.....	4	208
Total 4 inches in South Boston....			589
ROXBURY.			
Tremont.....	Near Texas Avenue.....	6	200

RECAPITULATION.

SECTION.	1865.	DIAMETER IN INCHES.				
		36	12	8	6	4
Boston Proper..	Total number of feet laid.....				2,392	246
	Stop-cocks in same.....		1		5	
South Boston...	Total number of feet laid.....				1,323	589
	Stop-cocks in same.....					1
Roxbury.....	Total number of feet laid.....				200	
	Sums of Pipes.....				3,915	835
	Sums of Stop-cocks.....		1		5	1

Statement of the Length of different Sizes of Pipes laid, and Number of Stop-cocks put in, to January 1, 1866.

	DIAMETER OF PIPES IN INCHES.										Aggregate.
	40	36	30	24	20	16	12	8	6	4	
Ft. of Pipe laid in Brookline, Roxb'y and Boston proper	23,082	19,991	29,096	5,773	.....	6,096	60,001	1,114	241,426	80,593	
Number of Stop-cocks in same.....	4	6	8	10	1	19	116	2	495	276	
Ft. of Pipe laid in South Boston					8,155	.....	18,938	2,871	91,378	26,284	
Number of Stop-cocks in same					4	.....	31	2	128	62	
Ft. of Pipe laid in East Boston.....					15,972	1,523	16,150	.....	69,493	4,418	
Number of Stop-cocks in same					6	3	23	.....	91	29	
Ft. of Pipe laid in Newton and Needham.....		1,074	2,140	.....	.....	.....	159	.....	.....	.....
Number of Stop-cocks in same.....					.....	.....	2	.....	1	.....
TOTALS. — Length of Pipe laid.....	23,082	21,065	31,836	5,773	24,127	7,619	95,248	3,985	402,297	111,296	720,325 feet, equal to 137 mils. 2,965 ft. 1,3 1/4.
Number of Cock-stops put in.....	4	6	8	10	11	22	172	4	710	367	

Statement of Service Pipes laid in 1865.

Diam. in inches.	BOSTON PROPER.		SOUTH BOSTON.		EAST BOSTON.		TOTAL.	
	Number of Pipes.	Length in Feet.	Number of Pipes.	Length in Feet.	Number of Pipes.	Length in Feet.	Number of Pipes.	Length in Feet.
1	5	203	....	....	2	282	7	485
$\frac{3}{4}$	4	164	....	....	....	....	4	164
$\frac{3}{8}$	180	5,927	43	2,403	22	664	245	8,994
$\frac{1}{2}$	55	1,609	29	1,035	32	788	116	3,432
Aggregate.....							372	13,075
Making the total number up to January 1, 1866.....							25,631	

Repairs of Pipes during the year 1865.

WHERE.	DIAMETER OF PIPES IN INCHES.																TOTAL.		
	40	36	30	24	20	16	12	8	6	4	3	2	1½	1¼	1	¾		⅝	½
Boston.....	..	11	3	..	..	..	13	..	25	47	1	17	42	4	10	9	309	17	508
South Boston	2	..	1	..	..	1	..	..	..	..	3	..	44	11	62
East Boston.	7	..	..	..	1	..	..	..	..	..	3	1	25	..	37
Totals.....	..	11	3	..	9	..	14	..	26	48	1	17	42	4	16	10	378	28	607

Of the leaks that have occurred in pipes of 4 inches and upwards, 81 were on the joints, 6 by settling of the earth, 16 by frost, 7 by defective pipe, 1 struck by pick; total, 111. Of the leaks of 2 and 3 inches and in service pipes, 171 by settling of earth, 72 by frost, 57 by defective pipe, 21 by defective joint, 4 by defective faucet, 21 by defective coupling, 6 by defective packing, 38 by rust, 13 faucet pulled out, 3 by

faucet blown out, 28 stiff connections, 23 stopped by fish, 26 struck by pick, 1 struck by nail, 5 eaten by rats, 1 by pile-driving, 1 by breaking of boxing, 1 by sewer-diggers, 1 stop-cock broken by sewer-diggers, 1 by flange blown out, 1 by settling of a drain, 1 cut by some person. Total, 496.

Statement of Number of Leaks, 1850-1865.

YEAR.	DIAMETER OF		TOTAL.
	Four inches and upwards.	Less than Four inches.	
1850.....	32	72	104
1851.....	64	173	237
1852.....	82	241	323
1853.....	85	260	345
1854.....	74	280	354
1855.....	75	219	294
1856.....	75	232	307
1857.....	85	278	363
1858.....	77	324	401
1859.....	82	449	531
1860.....	134	458	592
1861.....	109	399	508
1862.....	117	373	490
1863.....	97	397	494
1864.....	95	394	489
1865.....	111	496	607

Hydrants.

During the year fifteen new Hydrants have been established, as follows : Nine in Boston proper, five in South Boston, and one in Roxbury. One Hydrant has been taken out, leaving a total of fourteen.

Total number of Hydrants established up to January, 1866 :

In Boston proper	.	.	.	.	.	991
South Boston	.	.	.	.	.	327
East Boston	.	.	.	.	.	191
Brookline	.	.	.	.	.	3
Roxbury	.	.	.	.	.	13
Charlestown	.	.	.	.	.	11
Chelsea	.	.	.	.	.	8
						<hr/>
Total	.	.	.	.	.	1,544

Thirty-one Hydrants have been taken out and replaced by new or repaired ones, and eighty-six boxes have been renewed. The Hydrants have had the attention of former years paid them.

Stop-Cocks.

Seven new Stop-cocks have been established this year, and twenty-seven boxes over old ones renewed. All the Stop-cocks have had the usual attention paid them.

*Statement of Pipes and other Stock on hand, exclusive of Tools,
January, 1866.*

NUMBER OF	DIAMETER IN INCHES.											
	40	36	30	24	20	16	12	8	6	4	3	2
Pipes.....	17	18	88	7	48	28	23	81	115	63	12	....
Blow off Branches.....	1	....	3	....	....	....	....	....	....	....	....	....
Y. Branches.....	....	....	11	....	....	1	1	....	5	....	....	....
3 Way Branches.....	7	4	1	....	3	4	19	11	22	2	1	6
4 Way Branches.....	....	....	2	1	....	2	4	11	3	....	....	....
Flange Pipe.....	2	2	4	4	4	1	1	....	....	....	....	....
Sleeves.....	5	....	4	9	3	3	7	5	2	20	4	8
Clamp Sleeves.....	....	3	6½	....	....	2½	3	....	11	22	3	....
Caps.....	2	2	4	1	....	2	....	7	8	24	....	....
Reducers.....	3	2	1	2	....	2	5	6	10	9	....	....
Bevel Hubs.....	....	....	....	....	....	....	....	....	9	11	....	....
Curved Pipes.....	....	3	9	....	5	2	4	....	....	....	....	....
Quarter Turns.....	....	....	....	....	2	....	5	4	5	8	....	7
Double Hubs.....	....	....	....	....	....	9	....	....	....	....	....	....
Offset Pipes.....	....	....	....	....	....	....	....	....	10	7	....	....
Yoke Pipes.....	....	....	....	....	....	....	5	....	9	....	....	....
Man-Hole Pipes.....	2	....	2	....	....	....	....	....	....	....	....	....
One eighth Turns.....	1	....	....	....	1	....	2	3	3	9	....	....
Pieces of Pipe.....	4	9	10	2	32	3	9	1	12	5	2	....
Stop-Cocks.....	1	1	1	2	2	2	5	5	12	10	2	....

Hydrants. 7 new Lovell, 6 Wilmarth (old), 5 Lovell, (old).

For Hydrants. 7 bends, 42 lengtheners, 18 frames, 10 covers, 28 plungers, 14 screws, 23 wastes, 40 nipples, 33 valve seats, 55 stuffing boxes, 5 hose couplings, 656 lbs. composition castings, 2,540 lbs. iron castings, 32 lbs. of iron castings for wharf hydrants, 24 composition couplings for ditto, 4 wharf hydrants.

For Stop-Cocks. 3 36-inch screws, 1 30-inch ditto, 2 24-inch ditto, 1 16-inch ditto, 25 6-inch ditto, 3 4-inch ditto, 6 4-inch unfinished ditto, 1 ditto for waste weir, 1 ditto for Brookline Reservoir, 3 12-inch plungers, 6 6-inch ditto, 5 4-inch ditto, 2 6-inch rings, 18 4-inch ditto.

Meters. In the shop, 1 2-inch meter, 41 1-inch meters, 77 $\frac{5}{8}$ -inch meters, 18 $\frac{5}{8}$ -inch imperfect, 27 condemned, 140 meter boxes (wood).

Stock for Meters. 108 lbs. composition castings for 2-inch meters, 78 1-inch nipples, 328 $\frac{5}{8}$ -inch ditto, 8 1-inch connecting pieces, 5 $\frac{5}{8}$ -inch ditto, 5 2-inch ditto, 29 $\frac{5}{8}$ -inch stop-cocks, 20 1-inch ditto, 21 clocks, 40 glasses, 70 rubber nipples, 9 lbs. rubber packing, 31 brass spindles, 6 frame covers, 10 feet leather hose, 200 bolts, nuts and screws, 3 sheets straw paper, 4 platforms, 2 3-inch fish-pots, 2 4-inch ditto.

For Service Pipe. 7 1-inch union cocks, 22 $\frac{3}{4}$ -inch ditto, 94 $\frac{5}{8}$ -inch ditto, 31 $\frac{1}{2}$ -inch ditto, 5 1-inch T cocks, 13 $\frac{3}{4}$ -inch ditto, 9 $\frac{5}{8}$ -inch ditto, 8 $\frac{5}{8}$ -inch Y cocks, 8 air cocks, 29 $\frac{5}{8}$ -inch straight cocks, 73 $\frac{1}{2}$ -inch ditto, 15 $\frac{5}{8}$ -inch with lever handles, 4 2 $\frac{1}{4}$ -inch connection couplings, 9 1 $\frac{1}{4}$ -inch ditto, 23 1 $\frac{1}{4}$ -inch nipples, 40 1-inch couplings, 30 $\frac{3}{4}$ -inch ditto, 16 $\frac{5}{8}$ -inch male couplings, 17 $\frac{3}{4}$ -inch nuts, 40 $\frac{5}{8}$ -inch couplings, 98 tubes and 40 nuts, 19 $\frac{1}{2}$ -inch couplings and 40 nuts, 7 2-inch flanges, 3 1-inch ditto, 48 $\frac{5}{8}$ ditto, 15 complete $\frac{5}{8}$ double-headers with flanges and pipes, 3 6-inch flanges, 25 $\frac{5}{8}$ -inch flange-cocks, 8 $\frac{1}{2}$ -inch ditto, 96 $\frac{5}{8}$ -inch unfinished straight-cocks, 30 $\frac{5}{8}$ -inch unfinished lever-handled cocks, 91 lbs. unfinished castings for couplings, 35 lbs. composition castings for wharf hydrants, 363 lbs. composition castings for union cocks, 302 iron tubes, 200 iron caps, 75 extension tubes, 150 $\frac{5}{8}$ -inch long boxes (iron), 20 1-inch ditto, 9 T boxes, 40 Y boxes, 20 square boxes.

Lead Pipe. 733 lbs. 2-inch pipe, 217 lbs. 1 $\frac{1}{4}$ -inch pipe, 1,658 lbs. 1-inch pipe, 420 lbs. $\frac{3}{4}$ -inch ditto, 1,232 $\frac{5}{8}$ -inch ditto, 726 lbs. $\frac{1}{2}$ -inch ditto, 953 lbs. sheet lead, 67 lbs. block tin and solder, 60 lbs. $\frac{5}{8}$ -inch block tin pipe.

Blacksmith Shop. 850 lbs. square iron, 565 lbs. round iron, 700 lbs. flat ditto, 177 lbs. cast steel, 890 lbs. working pieces iron.

Carpenter's Shop. 500 feet spruce plank, 400 feet spruce boards, 200 feet oak plank, 250 feet pine boards, 4 hydrant boxes, 14 top pieces, 50 hydrant boxes unfinished, 12 stop-cock boxes unfinished, 5 meter boxes unfinished, 125 lbs. nails and spikes.

Wharf Hydrants. 4 complete, 2 incomplete.

Stable. 3 horses, 3 wagons, 2 buggies, 1 pung, 5 sets harness, 2 sleighs, 1 ton English hay, 500 lbs. salt hay, 30 bushels grain, stable utensils.

Tools. 1 steam-engine, 1 large hoisting crane, 1 boom derrick, 4 geared hand derricks, 2 sets of shears and all the rigging for the same, tools for laying and repairing main and service pipes, 2 engine lathes, 1 fox ditto, 1 hand ditto, 1 upright drilling machine, 3 grindstones, and the necessary tools for carrying on the machine, blacksmith's, carpenter's, and plumber's shops, 2 large tool houses, 1 small ditto, 1 40-inch proving press, 1 36-inch ditto, 1 small ditto, also office furniture, and a large lot of patterns stored at pipe-yard and at the founderies where we obtain castings.

At Beacon Hill Reservoir. 5 swivel pipe patterns, 1 swing stage, capstan frame and levers, 1 composition cylinder, 1 6-inch ditto, 4 jets, 1 reducer and two sets of 12-inch plates, and 2 4-inch plates, 3 composition reel jets, 6 cast iron jets, 1 drinking fountain.

Miscellaneous. 1 freight of gravel, 200 bricks, 768 lbs. gasket, 5 kegs bolts, 375 feet damaged hose, 1 cord wood, 16 gallons oil, 12 lbs. old composition, 1 load sand, 12 reservoir gate covers, 5 manholes, 6 plates, lot of old lumber, lot of old machinery from Marlboro.

Respectfully submitted,

E. R. JONES,
Superintendent Eastern Division, B. W. W.

WATER REGISTRAR'S REPORT.

WATER REGISTRAR'S OFFICE,
BOSTON, May 1, 1866.

OTIS NORCROSS, ESQ. *President of the Cochituate Water Board:*

SIR: In compliance with the 16th section of the Ordinance, providing for the care and management of the Boston Water Works, I have the honor to submit the following

REPORT:

The total number of water-takers now entered for the year 1866, is 27,489, being an increase, since Jan. 1, 1865, of 443.

During the year 1865, there have been 677 cases where the water has been turned off for non-payment of water-rates.

Of this number 559 have been turned on, leaving a balance of 118 still remaining off.

The total amount of water-rates received from Dec. 31, 1864, to January 1, 1866, is \$ 450,341 48

Of the above there was received for water used
in previous years, the sum of \$ 23,054 16

Leaving the receipts for water furnished during the year 1865, the
sum of 427,287 32

In addition to the above there has
been received for turning on water
in cases where it had been turned
off for non-payment of rates, the
sum of 1,092 00

Total \$ 451,433 48

The amount received for water-rates from Jan. 1,
1866, to May 1, 1866, is . . \$ 340,966 53

Amount carried forward, \$ 451,433.48

<i>Amount brought forward,</i>	\$ 451,433.48
Of this amount there was received, for water used in previous years, the sum of	27,165 06
Leaving the receipts for water (as- sessed for the year 1866), to May, 1, 1866, the sum of . . .	313,801 47
In addition to this amount there has been received for water furnished by meters from Jan. 1, 1866, to April 1, 1866, the sum of . .	34,349 51
The total amount received from Jan. 1, 1866, to May 1, 1866, for turning on water in cases where it had been turned off for non-payment of rates, is . . .	686 00
	<hr/> 376,002 04
Total receipts from Jan. 1, '65, to May 1, 1866,	\$ <u>827,435 52</u>
The increased amount of income in 1865, over the previous year, is	\$ 19,446 72
The total amount of assessments now made for the present year, is	360,436 37
The estimated amount of income from the sales of water during the year, 1866, is . . .	475,000 00
The expenditures of my office during the year 1865, has been	14,652 24
The items of this expenditure are as follows:—	
Paid Wm. F. Davis as Registrar	\$ 1,900 00
Chas. H. Little as Treasurer's clerk	1,475 00
Charles L. Bancroft as clerk	1,089 96
Stephen Badlam " "	1,089 96
Edward Jennings	960 72
Charles C. Badlam	960 72
	<hr/>
<i>Amount carried forward,</i>	\$ 7,476 36

<i>Amount brought forward,</i>				\$ 7.476.36
Paid George Stanwood on meters	.	.	.	720 91
R. D. Child as Inspector	.	.	.	690 81
C. M. Thompson “ “	.	.	.	630 81
F. W. Fay “ “	.	.	.	630 81
T. L. Kelley, “ “	.	.	.	685 81
J. Hayward “ “	.	.	.	600 81
M. F. Hews “ “	.	.	.	222 50
F. W. Tewksbury “ “	.	.	.	217 50
H. S. Talbot “ “	.	.	.	212 50
J. F. Mayo on meters	.	.	.	238 68
G. E. Hunt as Inspector	.	.	.	181 67
E. A. Kendall “ “	.	.	.	155 00
B. F. Doten “ “	.	.	.	120 00
G. E. Richardson “ “	.	.	.	117 50
A. G. Bugbee “ “	.	.	.	115 00
Geo. Chamberlain “ “	.	.	.	115 00
R. F. Lyman, “ “	.	.	.	110 00
F. Crowell “ “	.	.	.	102 00
E. A. Jennings “ “	.	.	.	84 17
M. O. Donnell “ “	.	.	.	60 00
E. A. Sherman “ “	.	.	.	60 00
James Tuttle “ “	.	.	.	60 00
D. H. Bradlee “ “	.	.	.	57 50
F. H. Phillips “ “	.	.	.	57 50
John Sherburn “ “	.	.	.	52 50
T. H. Palmer “ “	.	.	.	50 00
F. C. Hogan “ “	.	.	.	29 17
H. T. Beal “ “	.	.	.	29 17
Ames Ramsdell “ “	.	.	.	29 17
E. B. Chandler “ “	.	.	.	10 00
J. L. Fairbanks for stationery	.	.	.	291 25
J. E. Farwell & Co. for printing	.	.	.	438 14
Amount	.	.	.	\$ 14,652 24

Amount brought forward, . \$ 14,652 24

The expenditures of my office from January 1, 1866, to date, have been \$ 5,265.00. The items of this expenditure have been as follows : —

Paid Wm. F. Davis as Water Registrar,	\$ 633 33	
Charles H. Little Treasurer's Clerk .	500 00	
Charles L. Bancroft as clerk .	363 32	
Stephen Badlam " " .	363 32	
Edwin Jennings " " .	363 32	
C. C. Badlam as Inspector .	320 24	
R. D. Child " " .	253 33	
J. Hayward " " .	253 33	
T. L. Kelley " " .	253 33	
F. W. Fay " " .	253 33	
C. M. Thompson " " .	253 33	
H. T. Beal " " .	253 33	
Ames Ramsdell " " .	253 33	
F. C. Hogan " " .	253 33	
W. K. Langford " " .	170 86	
J. F. Mayo on meters .	315 18	
J. L. Fairbanks, stationery .	112 00	
J. E. Farwell & Co. printing .	96 79	
		5,265 00
Total		<u>\$ 19,917 24</u>

METERS.

The total number of meters now applied to the premises of water-takers, is 586. Of this number 420 are $\frac{5}{8}$ -inch, 143 1-inch, 19 2-inch, 3 3-inch, and 1 4-inch size. They are attached to a variety of establishments, embracing hotels, railroads, manufactories, stables, confectionery, oyster saloons, and buildings occupied by several tenants.

The following table exhibits the yearly revenue received from the sales of Cochituate water, since its introduction into the city, October 25, 1848 : .

Received by Water Commissioners, as per					
Auditor's Report, in 1848,					\$ 972 81
From January 1, 1849, to January 1, 1850,					71,657 79
"	"	1850,	"	1851,	99,025 45
"	"	1851,	"	1852,	161,052 85
"	"	1852,	"	1853,	179,567 39
"	"	1853,	"	1854,	196,352 32
"	"	1854,	"	1855,	217,007 51
"	"	1855,	"	1856,	266,302 77
"	"	1856,	"	1857,	282,651 84
"	"	1857,	"	1858,	289,328 83
"	"	1858,	"	1859,	302,409 73
"	"	1859,	"	1860,	314,808 97
"	"	1860,	"	1861,	334,544 86
"	"	1861,	"	1862,	365,323 96
"	"	1862,	"	1863,	373,922 33
"	"	1863,	"	1864,	394,506 25
"	"	1864,	"	1865,	430,710 76
"	"	1865,	"	1866,	450,341 48
"	"	1866,	May 1,	1866,	375,316 04
Total					<hr/> \$ 5,105,803 94

Statement showing the number of houses, stores, steam engines, &c. in the City of Boston, supplied with Cochituate water to the 1st of January, 1866, with the amount of water-rates paid for 1865 :—

19,508	Dwelling-houses	.	.	.	.	\$ 238,033 12
34	Boarding do	.	.	.	.	1,809 00
104	Model do	.	.	.	.	4,342 00
6	Lodging do	.	.	.	.	158 00
14	Hotels	.	.	.	.	1,073 00
4,473	Stores and shops	.	.	.	.	40,251 57
196	Buildings	.	.	.	.	7,256 95
413	Offices	.	.	.	.	3,263 49
50	Printing offices	.	.	.	.	717 33
25	Banks	.	.	.	.	313 00
31	Halls	.	.	.	.	476 25
1	Theatre	.	.	.	.	19 50
27	Private schools	.	.	.	.	224 00
9	Asylums	.	.	.	.	503 63
3	Green-houses	.	.	.	.	32 00
64	Churches	.	.	.	.	686 63
7	Markets	.	.	.	.	890 50
17	Cellars	.	.	.	.	783 00
376	Restaurants and saloons	.	.	.	.	4,639 89
4	Club-houses	.	.	.	.	86 50
4	Bath-houses	.	.	.	.	255 00
50	Photographers	.	.	.	.	1,571 00
15	Packing-houses	.	.	.	.	355 96
984	Stables	.	.	.	.	8,105 43
24	Factories	.	.	.	.	646 13
1	Brewery	.	.	.	.	25 00
2	Beer factories	.	.	.	.	73 00
5	Bleacheries	.	.	.	.	69 50
1	Laundry	.	.	.	.	25 00

Amount carried forward,

\$ 316,685 38

<i>Amount brought forward,</i>	\$ 316,685 38
1 Dyehouse	54 00
65 Bakeries	538 50
5 Ship yards	34 42
1 Dry dock	25 00
2 Dry docks and engines	34 00
49 Shops "	4,205 25
13 Stores "	1,055 34
5 Foundries "	254 00
10 Factories "	630 96
7 Printing "	698 98
1 Bakery "	33 00
1 Ship yard "	62 07
2 Binderries "	223 82
3 Buildings "	378 44
1 Pottery "	35 00
1 Laundry "	36 00
35 Stationery engines	1,349 68
5 Armories	61 50
3 Gymnasiums	56 50
415 Hand-hose	2,790 00
15 Fountains	118 00
1 Gaslight Co. (9 months)	569 67
1 Gaslight Co. (filling tanks)	295 46
1 Milldam Co.	300 00
1 State House	134 50
1 Home for discharged soldiers	50 00
1 Home for Little Wanderers	49 58
1 U. S. Rendezvous	54 50
1 Custom House	150 00
50 Steam-boats	7,296 08
1 Office (Harbor Master)	6 00
1 Do. (city scales)	9 00
<i>Amount carried forward,</i>	<u>\$ 338,274 63</u>

<i>Amount brought forward,</i>	\$ 338,274 63
1 Old State House	27 00
1 Court House	262 50
1 Probate building	47 50
1 House of reception	10 00
6 Fire-alarm moters	65 00
22 Fire-engine, hose and hook and ladder houses	527 00
8 Police stations	728 00
279 Public schools	1,894 00
2 City stables	135 00
1 Offal station	200 00
1 Steamer Henry Morrison	192 56
1 House of Correction	462 00
1 Jail for Suffolk County	243 00
1 Lunatic Hospital	225 00
1 Free City do.	250 00
1 Public Library,	50 00
1 Faneuil Hall	40 00
1 City building	37 50
1 Shop (Paving Department)	9 00
Common Sewer Department (making mortar)	50 00
Public urinals	145 00
Street sprinkling	400 00
Deer park	10 00
Boston Common	50 00
Filling boiler	2 00
Mechanic's Fair	25 00
Building purposes	1,602 79
Contractors for supplying shipping	2,071 67
Metered water	79,251 17
	<hr/>
	\$ 427,287 32

Statement showing the Number and kind of Water Fixtures contained within the Premises of Water-takers in the City of Boston to January 1, 1866, as compared with previous years.

1863	1864	1865	REMARKS.
4,789	4,831	4,797	Taps. These have no connection with any drain or sewer.
37,289	38,844	40,184	Sinks.
14,100	15,488	16,767	Wash-hand basins.
4,921	5,262	5,475	Bathing-tubs.
5,788	6,286	6,752	Pan water-closets.
6,529	7,117	7,317	Hopper water-closets.
		181	" " pull.
846	935	315	" " self-acting
		213	" " waste.
		498	" " door.
1,548	1,644	1,741	Urinals.
4,967	5,535	6,087	Wash-tubs. These are permanetly attached to the building.
17	12	737	Shower-baths.
12	12	13	Hydraulic rams.
729	708	715	Private hydrants.
216	278	334	Slop-hoppers.
		28	Foot-baths.
81,751	86,949	92,154	

Respectfully submitted,

WILLIAM F. DAVIS,
Water Registrar.

REPORT OF THE CITY ENGINEER.

OFFICE OF CITY ENGINEER,
BOSTON, April 30, 1866.

OTIS NORCROSS, ESQ. *President Cochituate Water Board :*

SIR : The following Report relating to the general condition of the Water Works, — so far as the same has come to my knowledge by personal observation and the partial reports made to me by the Superintendents, as required by the rules of the Board, — has been prepared in compliance with the 13th section of the Water Ordinance.

LAKE COCHITUATE.

From personal examinations of the several structures, &c. at the Lake, at various times during the past year, I am gratified to say that, their condition, as well as that of the adjacent grounds, is generally good, and, in some respects, improved. The principal exception is in the condition of the Course Brook culvert, — a new structure, built, under rather unfavorable circumstances, by the late lamented Superintendent of the Western Division. A portion of the lower end of this culvert fell in this spring, and has been temporarily repaired. At the next low stage of the water this culvert should be rebuilt, and more care taken to secure a firm foundation for the inverted arch, at a lower level, and also to prevent the passage of the water along the outside of the culvert, washing away the sand, and thus, in time, undermining it.

The slope-walls which have been built during the year in the Northern Division of the Lake are a manifest improvement, and have not only improved the appearance of the shores, but have

served to arrest the rapid encroachments of the water upon the sandy borders of the Lake. The necessity of continuing to extend these walls is undoubtedly fully appreciated by the Board.

The Filter-dam at Pegan Brook has continued to work well, requiring but little repairs during the year.

The surface of the water in the Lake on the first day of January, 1865, was five feet ten inches above the bottom of the conduit, or seven and one half feet below high-water mark. On March the nineteenth the Lake was full, and on the thirty-first of the same month the water began to waste at the outlet-dam. June first, the waste ceased, and on the sixteenth the Lake began to fall, continuing to lower, with slight fluctuations, until the eighteenth of December, when the lowest point of the year, eight feet three inches above the bottom of the conduit, was reached. The water commenced to rise December twenty-fifth, and on the first of January, 1866, stood at 8 feet 11 inches, or 3 feet 1 inch higher than at the beginning of the year. The lowest point reached in 1865 was 3 feet 5 inches higher than the lowest point of 1864, — a result entirely due to the marked decrease in the consumption of water; for, if the rate of consumption had been the same from June sixteenth to December twenty-fifth, — the term during which the water in the Lake was falling, — as the average rate of 1864, the increased amount drawn from the Lake would have been equivalent to a depth of 3 feet 6 inches, and the water in the Lake would have stood on the twenty-fifth of December, 1865, one inch lower than the lowest point of 1864, or only 5 feet 9 inches above the bottom of the conduit.

It is, indeed, a source of congratulation that the efforts of the Board have been so effectual in checking the inordinate waste of water, which a few years since threatened to exhaust our source of supply.

In order to realize fully the importance of economy in the use of the water, it is only necessary to suppose a possible con-

tingency. We began the year 1865 with only 5 feet 10 inches of water in the Lake above the bottom of the conduit. Suppose that, instead of the gratifying economy which has reduced the consumption to a daily average, — for the whole year, of 12,662,000 gallons, — the wastefulness of 1861, when the estimated consumption was over 18,000,000 gallons, had prevailed; and suppose also, that, instead of the actual rain-fall at the Lake for the past year, — $49\frac{4}{10}$ inches, — we had had only $27\frac{2}{10}$ inches, which was the actual rain-fall of 1822, the result would have been that the water in the Lake, on the first of January, 1866, would have been nearly *four feet below* the bottom of the conduit, and artificial means would have been necessary for several months of the year to raise the water into the conduit.

From the table showing the average monthly and yearly heights of the water in the Lake, above the bottom of the conduit, since 1850, it will be seen that the average height for the year 1865 has been $10\frac{7}{10}$ feet, or very nearly the same as the previous year, and that the lowest average monthly height for the year was $7\frac{4}{10}$ feet, being two feet higher than the lowest average for 1864.

The usual statement of the rain-fall on the water shed of the Lake, the amount of water consumed and wasted, the available amount received into the Lake, and the available percentage of the annual rain-fall for a term of twelve years, is herewith submitted; from which it appears that the daily average amount received into the Lake during the term was about $22\frac{1}{2}$ millions of gallons; that the average daily waste (reckoning the whole number of days in the year,) at the outlet-dam, for the first six years of the term, — before the raising of the dam, — was 14,378,900 gallons, while for the last six years it was 3,938,560 gallons: it also appears that the available percentage of rain-fall received into the Lake for the past year was 43, and the average for the whole term was 48.

The following statement shows the amount of water wasted at the outlet-dam during the year :—

March, 1 day	26,853,062	gallons.
April, 30 days	526,626,253	“
May, 31 “	1,134,641,359	“
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Total	1,688,120,674	“

This amount is equal to a daily average, for the whole year, of about 4,625,000, and could it have been stored, would have supplied the city for 133 days at the average rate of consumption for the year.

CONSUMPTION OF WATER.

The usual statement of the daily average number of gallons of water consumed for each month and year from 1849 to 1865, inclusive, is herewith presented, and it must be a source of general satisfaction to our fellow-citizens to know that the daily average for the past year amounts to only 12,662,000 gallons, against 16,681,000 for the previous year, a reduction of 4,219,000 gallons per day, or over twenty-five per cent. And it will be seen, by an inspection of the table or statement above referred to, that the daily average for the last three months of the year was only 11,300,000 gallons, being a still further reduction of 1,362,000 gallons per day. The estimates of consumption have been made by the same method employed for the past two years, and the results are probably somewhat in excess of the actual consumption.

During the past year the water was shut off at the Lake nine times for the purpose of measuring the amount actually used by the city, by observations of the heights of the water in the Brookline and city reservoirs. These observations were taken on two days in February, two in April, three in May, and two in June, and covered each day of the week, being, in every instance but one, taken every hour of the day and night, and

with great care. A statement of the result of these observations will be found in a subsequent part of this report, from which it will appear that the least amount consumed in one day was 7,339,803 gallons for the twenty-four hours ending at twelve o'clock, M. on the thirtieth of April, and the largest amount consumed was 13,074,433 gallons for the twenty-four hours ending at twelve o'clock, M. June third. The average for the nine days was 10,735,723 gallons, or nearly 2,000,000 gallons less than the average for the whole year as estimated by the usual method. It will also be observed that for three days of the nine the actual consumption was only seven to nine millions of gallons per day, thus showing that the present legitimate wants of the city can be adequately served with a supply of, say, eight millions of gallons per day, and that the amount consumed in excess of that sum is, if not wasted, an unnecessary and extravagant use. This view is still further corroborated by an inspection of the night consumption for the four hours from midnight to four o'clock A. M. — hours when the rate of consumption should be very materially reduced: for it will be seen that the average hourly consumption for these hours, taking the eight days upon which the observations were made hourly, was 282,000 gallons, or at the rate of 6,768,000 gallons per day. That such a rate of consumption during the four hours after midnight is not legitimate, except in case of fire, must be self-evident, and a large proportion must be accounted waste. The only fire of any magnitude which occurred between midnight and four o'clock, A. M. on the days the observations were taken, was the Court and Sudbury Street fire on the thirtieth of April, between three and four o'clock, A. M., and it appears that the average draft per hour for two hours after the fire broke out was about 315,000 gallons, while on the other nights, when there were no fires, the hourly draft ran as high as 500,000 and 600,000 gallons. These facts must prove that, even the reduced rate of consumption of the past year involves a large waste or illegitimate use, and that, as I said before, we can

easily reduce our consumption to eight millions of gallons per day and be amply served.

The greatest estimated amount consumed on any one day during the year was about 18,000,000 gallons, on the twenty-second of January.

CONDUIT.

A thorough examination of the interior of the conduit has been made during the year in company with the Superintendent and members of the Board. The section from the Lake to Dedmun's Brook waste-wier was found to be coated with the peculiar vegetable matter alluded to in former reports, and has been thoroughly cleaned by the Superintendent. Those portions of the conduit resting on embankments and alluded to in former reports as being defective, by reason of cracks caused by the settling or spreading of the banks, were specially examined, and no marked change was apparent. In cases where repairs had been previously made, as at station 168 on the first division, at Ware's Valley and Webber's Barn, a slight crack in the cement pointing of the old fissures indicated that the widening of the breaches at these localities had not ceased, and that a more radical treatment of these difficulties must be applied to insure perfect safety. The worst cracks that were repaired during the year, were in those portions of the conduit in Newton where it crosses the "Bennett" and "Brown" meadows, so called, now owned by the city, and to form a part of the new reservoir. The cracked portion on the "Bennett" meadow extends from about station 119½ to station 126, — about 650 feet in length, — and that on the "Brown" meadow extends from station 133½ to station 137½, about 400 feet in length. As the embankments at these localities are to form a portion of the bank or dam of the new reservoir, both of these defective sections of the conduit will have to be rebuilt and placed upon foundations of solid masonry to insure perfect security. At several points on the line where the conduit is located in wet places and in deep cuttings

fissures were found bringing in water, and in some places considerable sand. The worst of these were at stations 75, 76 and 98, on the first division; at stations 20 and 32, on the second division; and at stations $37\frac{1}{2}$ and 40, on the third division. These fissures have all been plugged with wooden wedges and the sand brought in removed. The water having been shut off twelve times during the year has afforded opportunities for a thorough cleaning and a partial repairing of those portions of the conduit and tunnels requiring the same, so that the whole line may be said to be in better general condition than for years.

EASTERN DIVISION.

For the details of the condition of the works in this division the Board is referred to the Report of the Superintendent. The usual statement of the average monthly heights of the water in the Brookline and city reservoirs, above tide marsh level, for the past five years, has been prepared and is herewith submitted. It will be observed that the marked reduction in the consumption of water is apparent in the increased height at which the water in the city reservoirs has been maintained. The average level in the Beacon Hill Reservoir for the year was $3\frac{23}{100}$ feet higher than in 1864; in the South Boston $2\frac{82}{100}$ feet higher; and in the East Boston $\frac{29}{100}$ feet higher.

The following table shows the yearly average loss of head from Brookline to the city reservoirs for the past five years.

	1861	1862	1863	1864	1865
Loss of head from Brookline to Beacon Hill.....	6.54	6.35	6.27	6.10	3.21
Loss of head from Brookline to South Boston.....	9.66	8.93	11.05	11.82	9.24
Loss of head from Brookline to East Boston.....	27.47	28.27	30.24	28.04	28.09

In 1858, when the Dover Street Bridge was rebuilt, a portion of the main pipe which supplies South Boston was replaced with new pipes of Scotch manufacture, covered inside and out with a bituminous coating, designed to prevent rust and the formation of tubercular accretions on the inside of the pipes. An opportunity was recently afforded to examine the interior of one of these pipes, and it was found to be remarkably clean and free from rust and tubercles. The result of this experiment is very satisfactory, and there can be very little doubt that we now have a simple and not very expensive means of preventing the growth of tubercular accretions in cast iron pipes.

CHESTNUT HILL RESERVOIR.

During the past year a party has been detached from my office to make the necessary surveys to determine the location and construction of this reservoir. A preliminary rough survey had already been made, and furnished approximately the means of ascertaining the limits of the land required to construct the reservoir and protect the same from the liability of future objectionable surface drainage, or the too close proximity of any offensive establishments. The exact lines of all the separate estates within these limits were carefully surveyed and run out before proceeding to purchase the land, and since then a complete and thorough topographical survey of the whole territory has been made. Routes for the location of the main pipe or pipes to connect the reservoir with the present mains leading from Brookline to the city have been examined and partial surveys made; the exact route, however, has not yet been determined.

The estimates and reports made to the Board during the year, and the constant oversight of the work exercised by the Committees having the same in charge, have probably placed at your disposal all the information regarding the reservoir which the Board may desire to publish in the present Annual Report.

CONSUMPTION OF WATER.

Daily Average Number of Wine Gallons drawn from the Brookline Reservoir.

MONTH.	1849	1850	1851	1852	1853	1854	1855	1856
January.....	1,700,000	5,181,700	7,233,700	8,280,900	8,050,500	10,695,200	9,702,700	12,669,000
February.....	.....	5,214,000	7,221,100	8,790,300	8,643,600	10,654,200	10,349,800	12,791,000
March.....	1,550,009	4,841,200	6,137,900	8,521,100	8,202,200	9,582,100	10,125,600	12,504,000
April.....	.....	4,961,000	5,365,200	8,048,700	7,903,600	8,738,500	8,540,000	10,800,000
May.....	3,600,000	5,346,100	6,238,400	8,350,000	8,123,400	9,385,300	9,103,800	10,378,000
June.....	4,300,000	6,906,500	7,925,000	8,033,100	8,945,900	11,745,200	9,984,400	11,223,000
July.....	4,800,000	8,514,200	7,180,200	9,608,000	8,809,200	10,613,800	11,056,600	13,167,000
August.....	4,100,000	8,004,600	7,235,000	9,709,300	8,461,900	10,028,100	11,120,800	12,664,000
September.....	4,800,000	6,585,500	7,230,600	7,920,000	8,640,700	9,712,400	11,710,800	11,522,000
October.....	4,550,000	4,504,300	6,716,600	6,930,000	8,871,100	8,769,800	10,771,200	11,891,000
November.....	3,800,000	4,960,500	6,473,500	6,637,900	8,624,700	8,030,200	10,383,200	11,691,000
December.....	3,600,000	5,037,000	7,663,400	7,195,800	9,228,400	10,597,600	11,307,200	13,284,000
Average for year,	3,680,000	5,837,900	6,883,800	8,125,800	8,542,300	9,902,000	10,346,300	12,048,600

Consumption of Water. Daily Average Number of Wine Gallons drawn from the Brookline Reservoir.

MONTHS.	1857	1858	1859	1860	1861	1862	1863	1864	1865
January.....	15,089,000	12,160,000	14,512,000	17,862,000	21,106,769	17,000,000	16,112,000	18,954,000	13,412,000
February.....	14,175,000	14,399,000	14,769,000	18,901,000	20,804,131	17,000,000	17,328,000	18,846,000	13,318,000
March.....	13,941,000	14,154,000	14,480,000	15,409,000	19,453,344	17,300,000	16,681,000	16,841,000	12,027,000
April.....	12,454,000	13,465,000	13,760,000	14,621,000	17,151,593	15,300,000	15,125,000	16,506,000	11,975,000
May.....	12,414,000	11,423,000	11,302,000	14,790,000	16,687,832	14,300,000	15,407,000	16,094,000	13,660,000
June.....	12,504,000	10,867,000	11,639,000	17,838,000	17,231,984	16,600,000	16,138,000	17,730,000	14,391,000
July.....	13,551,000	13,621,000	13,219,000	17,239,000	18,897,809	16,400,000	15,954,000	18,112,000	13,207,000
August.....	13,077,000	13,141,000	12,704,000	19,297,000	18,272,365	17,000,000	16,980,000	16,188,000	13,426,000
September....	12,030,000	12,745,000	12,389,000	17,957,000	18,098,259	17,000,000	17,035,000	16,798,000	12,624,000
October.....	10,864,000	12,969,000	12,026,000	16,938,000	17,987,128	17,300,000	15,779,000	15,479,000	11,273,000
November....	11,372,000	12,143,000	12,715,000	16,862,000	16,604,076	17,100,000	16,028,000	14,079,000	11,750,000
December....	11,241,000	13,075,000	14,586,000	19,151,000	15,976,362	17,000,000	16,295,000	14,547,000	10,877,000
Average for year,	12,726,000	12,847,000	13,175,000	17,238,000	18,189,304	16,600,000	16,235,500	16,681,000	12,662,000

Statement of the amount of Water consumed for each hour on certain days in 1865, by actual measurement.

HOURS.	Sun. & Mon. Feb. 12 & 13.	Tues. & Wed. Feb. 21 & 22.	Mon. & Tues. April 24 & 25.	Sat. & Sun. April 29 & 30.	Tues. & Wed. May 9 & 10.	Wed. & Thurs. May 17 & 18.	Thurs. & Fri. May 25 & 26.	Fri. & Sat. June 2 & 3.	Sat. & Sun. June 10 & 11.
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.
12 M. to 1 P.M.	.....	.....	467,931	782,320	492,090	81,129	623,750	1,226,418	943,593
1 P.M. to 2 P.M.	630,562	.....	489,250	320,443	636,126	622,835	622,250	604,164	742,031
2 P.M. to 3 P.M.	394,214	.....	455,679	320,677	632,781	620,265	622,125	612,456	431,281
3 P.M. to 4 P.M.	621,352	.....	610,430	161,408	460,656	697,140	621,750	605,293	499,949
4 P.M. to 5 P.M.	543,652	.....	314,250	308,533	293,532	312,016	617,216	590,977	778,029
5 P.M. to 6 P.M.	470,504	3,140,700	314,250	458,500	490,573	773,139	465,875	602,401	470,905
6 P.M. to 7 P.M.	320,757	.....	295,677	475,597	613,221	538,562	616,715	549,523	318,529
7 P.M. to 8 P.M.	630,783	.....	304,250	300,187	308,500	537,063	383,277	367,629	452,816
8 P.M. to 9 P.M.	311,950	.....	304,713	300,183	451,924	221,657	538,652	610,445	458,500
9 P.M. to 10 P.M.	465,650	.....	153,033	297,790	458,094	292,323	414,644	454,260	617,125
10 P.M. to 11 P.M.	624,006	.....	227,149	141,396	299,438	222,304	468,426	433,553	300,191
11 P.M. to 12 M.	775,896	1,459,530	231,564	72,841	303,719	365,657	407,588	437,091	452,175

REPORT OF THE WATER BOARD.

59

12 M. to 1 A.M.	618,348	.....	154,375	59,981	299,436	217,071	225,695	284,941	295,657
1 A.M. to 2 A.M.	4,248	.....	227,211	.....	453,310	517,164	382,586	300,056	445,247
2 A.M. to 3 A.M.	8,496	.....	231,375	134,833	303,467	365,643	382,588	377,307	295,276
3 A.M. to 4 A.M.	466,672	.....	154,250	303,963	457,091	221,033	316,163	222,866	297,290
4 A.M. to 5 A.M.	540,948	.....	158,539	327,418	311,733	301,828	475,664	377,052	304,017
5 A.M. to 6 A.M.	399,988	1,458,020	396,030	171,144	474,472	539,948	471,379	462,438	472,409
6 A.M. to 7 A.M.	637,674	.....	547,760	320,856	635,408	480,504	709,143	573,471	474,475
7 A.M. to 8 A.M.	675,837	.....	473,430	327,277	665,600	486,898	722,474	652,406	798,848
8 A.M. to 9 A.M.	677,890	.....	716,374	781,975	502,885	733,525	651,257	806,009	639,041
9 A.M. to 10 A.M.	669,358	.....	478,162	320,972	640,778	632,473	571,538	487,046	639,169
10 A.M. to 11 A.M.	673,549	.....	390,253	170,874	485,180	489,908	564,731	638,772	642,297
11 A.M. to 12 M.	502,679	2,720,700	246,750	480,635	639,956	546,970	639,520	797,799	476,351
12 M. to 1 P.M.	483,340	.....	.....	.....	.....	.....	.....	.....	.....
	12,148,353	8,778,950	8,342,686	7,339,803	11,310,022	10,817,053	12,515,006	13,074,433	12,295,202

Conduit.

The following table shows the different heights at which the water has been running, and the number of days in each month at the different heights.

The height of the conduit is six feet four inches.

	HEIGHTS IN FEET AND INCHES.															
													These heights show a head on the Conduit.			
	0.0	4.10	5.0	5.4	5.6	5.8	5.10	5.11	6.0	6.1	6.2	6.4	6.5½	6.6½	6.8	7.0
	NUMBER OF DAYS IN EACH MONTH.															
January.....	2	....	15	...	...	...	1	1	3	1	1	1	1	1	1	2
February.....	2	4	20	...	...	...	...	...	...	...	...	...	...	...	...	2
March.....	...	31	...	...	...	...	...	...	...	...	...	...	...	...	...	...
April.....	2	22	6	...	...	...	...	...	...	...	...	...	...	...	...	...
May.....	3	...	13	...	...	...	...	...	5	...	...	...	...	...	...	10
June.....	2	...	...	...	...	...	...	...	28	...	...	...	...	...	...	...
July.....	...	...	...	10	2	...	...	...	19	...	...	...	...	...	...	...
August.....	...	...	...	...	31	...	...	...	...	...	...	...	...	...	...	...
September.....	1	...	7	10	...	10	...	...	2	...	...	...	...	...	...	...
October.....	...	...	31	...	...	...	...	...	...	...	...	...	...	...	...	...
November.....	...	...	30	...	...	...	...	...	...	...	...	...	...	...	...	...
December.....	...	...	27	...	...	...	...	...	4	...	...	...	...	...	...	...
Total.....	12	57	149	10	10	43	1	1	61	1	1	1	1	1	1	14

From this table it appears that the Conduit has been empty twelve days during the past year, partly full with a depth of water varying from 4 feet 10 inches to 6 feet 2 inches for 334 days; just full, one day; and for only eighteen days during the whole year has the Conduit been under a head.

Statement showing Amount of Rain-Fall on Water-shed of Lake Cochituate, Amount of Water consumed and wasted, available Amount received into Lake, available percentage of Rain-Fall, &c. from 1852 to 1865, inclusive.

YEAR.	Rain-Fall.	Amount of Rain-Fall on Water-shed of Lake Cochituate.	Amount of water consumed.	Amount of water wasted from Lake.	Total amount consumed and wasted.	Rise of Lake during the year.	Fall of Lake during the year.	Total available amount of Rain-Fall received into Lake.	Available daily average amount of Rain-Fall received into Lake.	Available percentage of Rain-Fall received into Lake.
	INCHES.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	
1852 *	47.93	15,759,207,000	2,974,042,800	4,020,563,885	6,994,606,685	.....	261,360,000	6,793,249,685	18,396,857	43 per cent.
1853	55.86	18,366,561,000	3,117,939,500	3,166,417,500	6,284,357,000	239,550,000	.....	6,523,937,000	17,873,800	35 per cent.
1854	43.15	14,187,562,000	3,614,230,000	4,187,733,020	7,801,963,020	.....	217,800,000	7,584,163,020	20,778,529	53 per cent.
1855	34.96	11,494,719,000	3,776,399,500	No acct. kept.	.....	.....	326,700,000	.....	.....	.....
1856	40.30	13,414,892,000	4,409,787,600	" "	.....	598,050,000	.....	.....	.....	.....
1857	63.10	20,747,052,000	4,644,990,000	10,625,900,000	15,270,890,000	32,670,000	.....	15,303,560,000	41,927,562	74 per cent.
1858	48.06	15,999,232,000	4,680,155,000	1,934,500,000	6,623,655,000	.....	141,570,000	6,482,085,000	17,759,013	40 per cent.
1859 †	49.02	16,117,602,000	4,808,875,000	7,569,000,000	12,377,875,000	283,140,000	.....	12,661,015,000	34,687,712	78 per cent.
1860	55.44	18,228,471,000	6,309,108,000	None.	6,309,108,000	174,240,000	.....	6,483,348,000	17,714,065	35 per cent.
1861	46.44	15,269,303,000	6,639,065,900	3,377,558,966	10,016,654,866	.....	1,459,260,000	8,557,394,866	23,444,917	56 per cent.
1862	49.69	16,337,890,000	6,059,000,000	33,200,000	6,092,200,000	1,306,800,000	.....	7,399,000,000	20,271,233	45 per cent.
1863	69.30	22,785,586,000	5,927,032,500	2,165,696,470	8,092,748,970	762,300,000	.....	8,855,048,970	24,200,408	39 per cent.
1864	42.60	14,006,726,000	6,105,306,700	1,308,746,000	7,474,052,700	.....	1,848,577,000	5,625,475,700	15,370,152	40 per cent.
1865	49.96	16,202,266,000	4,621,630,000	1,088,120,674	6,309,750,674	743,242,500	.....	7,052,973,174	19,323,270	43 per cent.
Aver. 49.78		Aver. daily waste for 12 years,	9,157,527	Average daily capacity of Lake as a source of supply for 12 years, 22,658,957						
		" " " for 6 yrs. 152-59, 14,378,900								
		" " " last 6 " 160-64, 3,938,500								

* Observations of Rain-Fall at Lake Cochituate commenced 1852, and these observations are assumed as correct for the whole district. † Lake raised 2 feet.

REPORT OF THE WATER BOARD.

Table of the average monthly and yearly heights of water in the Lake above the bottom of the Aqueduct.

MONTHS.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.*	1860.	1861.	1862.	1863.	1864.	1865.
January.....	10.87	9.50	10.63	9.51	10.54	10.16	8.06	9.53	10.75	10.80	10.83	11.93	6.09	11.33	13.88	7.41
February.....	10.68	10.21	10.20	10.78	10.95	10.65	7.59	10.28	10.05	12.17	11.36	12.77	6.57	12.85	13.71	8.24
March.....	11.03	10.43	10.49	10.44	10.93	10.68	6.96	10.67	9.35	12.45	12.67	13.21	8.65	13.95	14.33	12.28
April.....	11.46	11.17	11.23	10.68	10.66	11.57	10.24	12.30	9.36	12.06	12.72	14.14	12.40	14.59	14.32	14.00
May.....	11.38	11.02	10.94	10.98	10.87	11.35	12.05	12.05	10.67	12.06	11.52	13.88	14.45	14.01	14.26	14.00
June.....	11.36	10.40	10.28	10.62	10.33	10.69	11.78	12.14	11.72	11.96	10.83	12.99	14.43	13.29	13.51	13.41
July.....	11.09	9.76	9.44	9.45	9.00	9.86	10.67	11.41	11.74	10.22	10.42	11.50	14.05	12.82	11.33	12.28
August.....	10.92	9.01	8.40	8.64	6.67	9.01	11.59	11.70	11.30	10.24	9.42	10.27	12.97	13.73	9.65	11.18
September.....	11.00	8.00	5.68	7.78	6.64	7.52	10.82	11.72	10.40	9.84	9.42	8.71	11.33	13.43	7.91	10.09
October.....	9.39	7.55	6.55	7.34	5.90	6.42	10.10	11.10	8.72	10.15	10.35	7.79	10.30	12.94	6.46	9.02
November.....	9.18	8.07	7.74	9.58	6.09	6.28	10.80	11.16	9.01	9.98	10.41	7.22	10.24	13.26	5.48	8.74
December.....	9.57	9.67	8.49	10.57	8.38	7.29	10.97	11.02	9.85	10.54	11.17	6.88	11.70	14.06	5.41	8.48
Yearly Averages.....	10.66	9.57	9.17	9.70	9.00	9.29	10.14	11.26	10.24	11.04	10.93	10.94	11.10	13.52	10.84	10.76

* High-water mark raised two feet.

Monthly Fall of Rain in Inches, in 1865.

MONTH.	PLACES AND OBSERVERS.							
	Lake Cochituate, by E. F. Knowlton.	Boston, by J. P. Hall.	Boston, by W. H. Bradley, Superintendent of Sewers.	Lowell, by Merrimac Manufacturing Company.	Lowell, by Locks and Canals Company.	Cambridge, Observatory.	Waltham, by Boston Manufacturing Company, J. R. Scott, Agent.	Providence, by A. Caswell.
January ..	4.09	4.47	3.80	3.61	3.99	4.87	1.40	5.29
February ..	4.45	5.08	4.34	3.20	3.73	4.31	2.63	5.45
March ..	5.48	4.83	4.50	4.24	4.20	4.25	4.25	5.56
April ..	2.18	2.57	2.42	1.80	2.24	2.88	2.25	2.08
May ..	8.25	6.90	6.64	5.71	6.32	6.24	6.28	6.23
June ..	0.91	2.83	2.64	2.54	1.85	2.20	1.36	1.55
July ..	3.10	4.26	3.18	2.39	1.87	3.67	3.52	3.91
August ..	3.36	1.42	1.32	2.42	2.79	1.76	2.45	0.74
September ..	1.66	0.62	0.71	0.56	0.56	1.00	0.82	0.27
October ..	6.99	6.21	5.92	5.86	5.16	5.71	5.01	4.60
November ..	4.78	4.46	3.69	2.08	3.65	3.68	3.91	4.03
December ..	3.31	4.18	2.75	2.88	2.97	3.02	1.96	4.08
Totals ..	49.46	47.83	42.00	37.38	38.82	43.59	35.84	44.69

NOTE.—Melted snow is, as usual, included in the above amounts of rain-fall.

The reports embodied in the foregoing table have been kindly furnished by the respective observers, and to them my thanks are due for their continued courtesies.

Table showing the days in 1865 upon which rain fell, and the amount in inches and hundredths, compiled from observations made by W. H. Bradley, Superintendent of Sewers.

DAYS.	MONTHS.											
	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	INCHES.											
1	.10	.....	.....	.....	.....	.....	.02	.....	.....	.03	.....	.32
2	.....	.....	.....	.....	.05	.....	.80	.....	.....	.....	.26	.....
3	.....	.....	.64	.....	.....	.....	.....	.....	.....	.....	.....	.....
4	.25	.....	.55	.....	.....	.....	.....	.....	.....	.20	1.16	.....
5	.....	.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6	1.08	.....	.....	.....	1.20	.....	.....	.....	.66	.....	.....	.....
7	.26	1.30	.....	.23	1.70	.....	.30	.28	.....	.....	.....	.58
8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9	.....	.....	1.00	.....	.46	.07	.....	.....	.....	.28	.....	.....
10	.96	.....	.62	.43	.....	.35	.....	.....	.....	.10	.....	.....
11	.....	.....	.....	.....	.17	.....	.41	.....	.....	.....	.....	.....
12	.....	.18	.....	.40	.....	.....	.....	.....	.....	.27	.....	.....
13	.....	.....	.....	.....	.05	.....	.16	.....	.....	.....	.....	.....
14	.20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
15	.....	.....	.....	.18	.....	.....	.....	.38	.....	1.63	.....	.....
16	.....	1.20	.20	.....	.....	.05	1.00	.....	.....	.69	.....	.....
17	.20	.....	.....	.....	.....	.....	.10	.....	.....	.....	.....	.....
18	.....	.....	.....	.....	1.40	.....	.....	.....	.05	.....	.....	.....
19	.....	.....	.....	.....	.....	.....	.....	.....	.....	.21	.....	.23
20	.....	.....	.....	.....	.....	.....	.33	.....	.....	.....	.....	.....
21	.....	.....	.....	.38	.....	.80	.....	.....	.....	.....	2.24	.....
22	.....	.....	.06	.15	.90	.80	.....	.38	.....	.....	.03	.....
23	.75	.....	.....	.....	.50	.....	.....	.28	.....	.....	.....	.....
24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
25	.....	.....	.....	.....	.....	.....	.06	.....	.....	.....	.....	.42
26	.....	1.06	.....	.....	.....	.57	.....	.....	.....	.....	.....	.04
27	.....	.....	.....	.....	.15	.....	.....	.....	.....	.....	.....	.10
28	.....	.10	.....	.....	.....	.....	.....	.....	.....	2.26	.....	.....
29	.....	.....	.....	.....	.06	.....	.....	.....	.....	.....	.....	.24
30	.....	.....	.69	.65	.....	.....	.....	.....	.....	.....	.....	.82
31	.....	.....	.83	.....	.....	.....	.....	.....	.....	.25	.....	.....
	3.80	4.34	4.59	2.42	6.64	2.64	3.18	1.32	.71	5.92	3.69	2.75

Annual Amount of Rain-Fall, in Inches, at Lake Cochituate, Boston, and vicinity, 1849 to 1865, inclusive.

YEAR.	PLACES AND OBSERVERS.						
	Lake Cochituate, by E. F. Knowlton.	Boston, by J. P. Hall.	Cambridge, by W. C. Bond and Geo. P. Bond.	Waltham, by E. Hobbs and J. R. Scott, Agent, Boston Manufacturing Co.	Lowell, by Merrimac Manufacturing Co.	Lowell, by Locks and Canals Co., J. B. Francis.	Providence, by A. Caswell
1849	....	40.30	40.97	40.74	51.09	....	34.69
1850	....	53.98	54.07	62.13	45.68	....	51.48
1851	....	44.31	41.97	41.00	41.00	....	43.30
1852	* 47.93	47.94	40.51	42.24	42.78	....	38.58
1853	* 55.86	48.86	53.83	45.04	43.92	....	53.27
1854	43.15	45.71	45.17	41.29	42.08	....	46.25
1855	34.96	44.19	47.59	40.63	44.89	48.41	39.05
1856	40.80	52.16	53.79	42.33	42.49	45.97	40.97
1857	63.10	56.87	57.92	44.04	49.38	52.02	44.74
1858	48.66	52.67	45.46	37.40	37.73	35.80	44.51
1859	49.02	56.70	....	48.49	47.51	48.41	45.29
1860	55.44	51.46	46.95	....	46.91	46.67	38.24
1861	46.44	50.07	50.14	....	43.32	42.95	44.25
1862	49.69	61.06	57.21	....	44.26	44.61	50.09
1863	69.30	67.72	56.42	53.66	52.37	57.81	54.17
1864	42.60	49.30	....	36.56	38.11	40.64	36.83
1865	49.46	47.83	43.59	35.84	37.38	38.82	44.69

* By J. Vannevar.

Average Monthly Heights of Water in Reservoirs at Brookline, Beacon Hill, South and East Boston, 1861—65 inclusive.

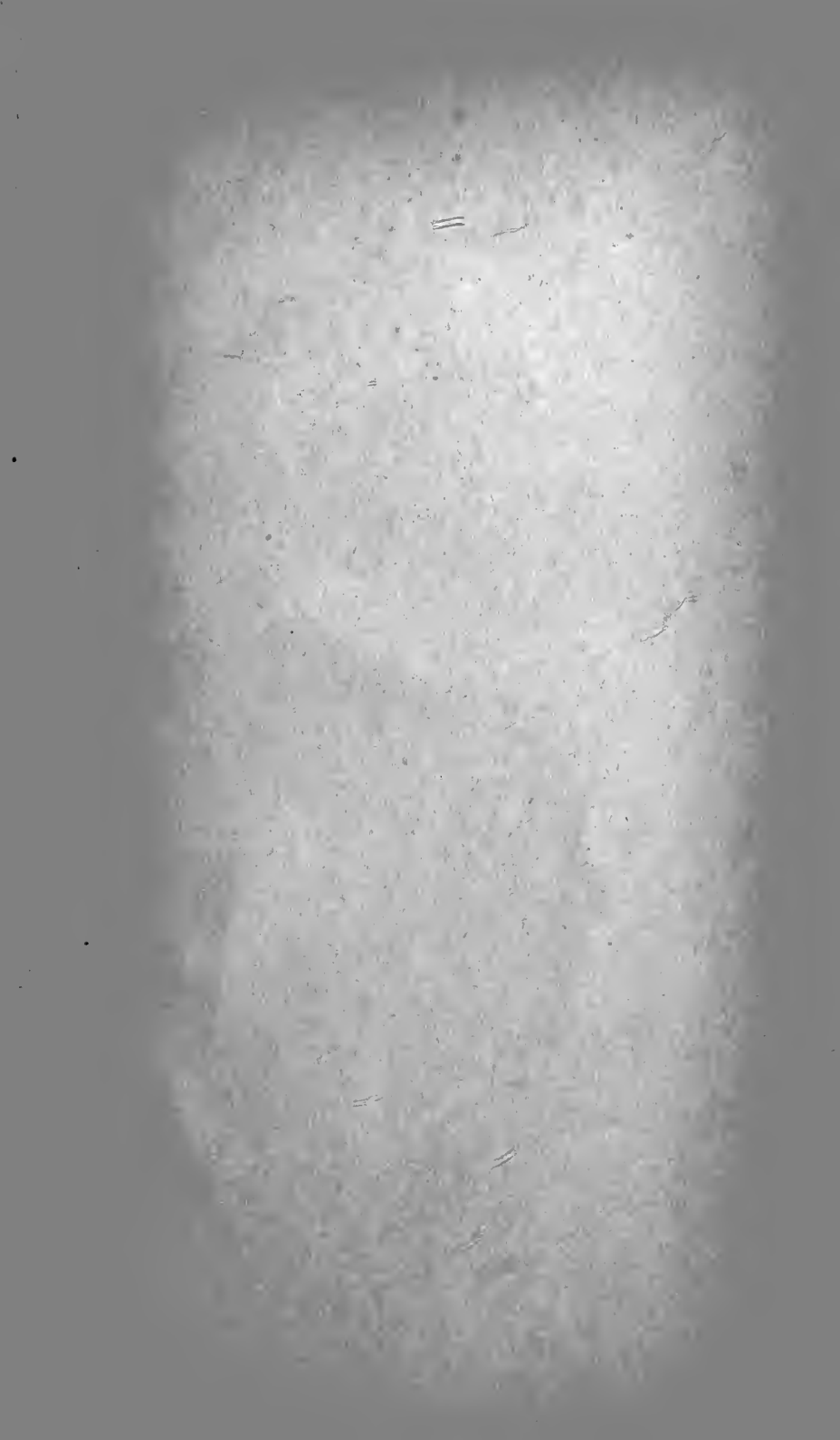
MONTH.	BROOKLINE.					BEACON HILL.					SOUTH BOSTON.					EAST BOSTON.				
	1861	1862	1863	1864	1865	1861	1862	1863	1864	1865	1861	1862	1863	1864	1865	1861	1862	1863	1864	1865
January.....	122.81	122.46	123.64	122.37	123.31	116.61	117.48	118.36	117.72	119.18	115.03	113.66	115.73	110.63	114.21	95.37	96.26	95.64	90.22	96.12
February.....	122.08	122.85	123.23	122.61	122.82	118.93	119.46	118.18	117.54	118.91	115.07	114.08	115.54	110.94	113.42	93.63	94.94	93.86	92.98	97.00
March.....	123.32	123.52	123.23	123.02	123.26	119.05	119.18	118.03	116.38	120.58	115.12	114.12	115.36	111.13	113.64	94.60	95.75	94.29	93.50	94.83
April.....	124.01	124.18	123.86	123.82	123.38	118.91	117.91	117.27	117.21	121.28	115.32	114.93	114.73	112.07	114.82	98.07	96.71	95.65	96.16	96.52
May.....	124.04	124.00	123.52	123.02	122.65	119.00	117.59	116.33	116.53	120.31	113.83	115.74	112.71	111.64	115.44	97.85	96.99	93.07	97.68	96.04
June.....	123.68	123.25	123.17	122.66	123.23	117.33	116.39	115.40	115.31	120.56	112.58	114.22	111.39	109.06	114.91	96.23	95.99	91.10	94.22	93.91
July.....	122.68	123.73	122.76	122.87	123.33	116.43	116.46	116.34	115.32	121.23	110.91	114.23	109.75	108.57	114.36	95.00	96.13	90.43	92.34	96.82
August.....	123.71	123.70	123.11	122.64	123.39	114.18	116.22	116.05	115.19	119.83	112.92	114.03	109.80	109.53	113.80	97.34	93.96	91.23	92.84	95.78
September.....	123.76	123.64	123.36	122.03	123.29	113.14	116.22	116.12	115.91	119.03	112.96	114.04	109.64	110.21	113.69	95.76	95.57	91.96	95.00	94.52
October.....	123.79	123.85	122.26	123.19	123.29	115.91	..*	115.87	118.17	118.43	114.68	114.24	109.99	112.49	112.89	95.56	91.80	95.02	97.55	93.38
November.....	123.80	124.07	123.63	122.78	123.38	116.74	117.20	116.85	118.55	120.14	114.14	115.94	111.25	112.49	112.74	96.40	93.57	93.36	98.14	92.23
December.....	124.00	123.46	122.53	122.29	123.24	117.46	115.23	118.30	117.35	120.50	113.79	116.35	109.90	113.89	113.78	97.37	95.77	89.79	97.27	94.34
Average.....	123.52	123.56	123.19	122.87	123.21	116.98	117.21	116.92	116.77	120.00	113.86	114.63	112.14	111.05	113.97	96.05	95.29	92.95	94.83	95.12

NOTE.—The above average heights are given in feet and parts, above marsh level. Maximum high water in the Brookline Reservoir is 124.6 feet above marsh level. By deducting the heights in the City Reservoirs from the heights in the Brookline Reservoir, in each month, we find the loss of HEAD in the different sections of the city at that time.

* Beacon Hill Reservoir was shut off for repairs two days in September, and twenty-nine days in October, 1862. Its average height of water is therefore, the average for eleven months only.

All of which is respectfully submitted.

N. HENRY CRAFTS, *City Engineer.*





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OF THE
CITY OF BOSTON.

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